THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1381.] LONDON, OCTOBER 29, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,

23, Gt. George St., Westminster, S.W.

DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —

PARKER & LESTER,

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THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,

STOCKTON-ON-TEES,

Manufacturing Gas Engineers.

See Advertisement, p. 765.

CEMENT

EARLE'S

BEST

PORTLAND CEMENT

MANUFACTURED BY

GEO. & THOS. EARLE

HULL.

PROMPT DESPATCH:

Seven Jetties on the River.

Two Private Railway Sidings.

FACILITIES FOR DESPATCH:

Six Railway-Wagon Entrances with Steam and Hydraulic Cranes.

Four Rully Entrances.

Three different Railway Companies within easy cartage distance.

Storage Capacity 8000 tons.

Office: 7, PIER STREET.

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ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,

FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,

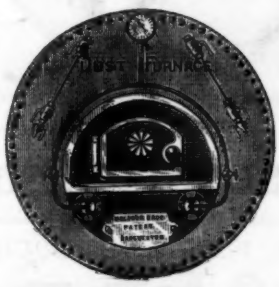
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

Cool Bars.

Easy Clinkering.

Independent of Chimney Draught.

Without moving parts.



Requires no extra Space.

Cannot get out of order.

Moderate Cost.

Results Guaranteed.

BREEZE FURNACES

FOR STEAM RAISING AND RETORT FIRING.

By adopting this System, Gas-Works practically save the whole cost of Fuel.

Knowing the value of these Furnaces, **MELDRUM BROTHERS** are prepared to fit them up, **ON APPROVAL,** to Lancashire, Cornish, Egg-ended, or other Type of Steam-Boiler; also to Retort-Furnaces. Terms on application.

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MANUFACTURER OF

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PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

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EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

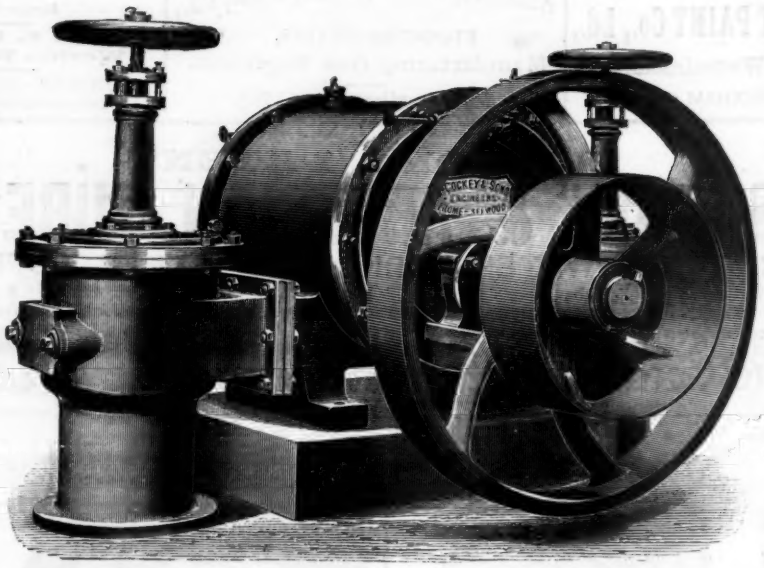
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

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Gas-Fittings in great variety.

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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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All of the most approved Designs.

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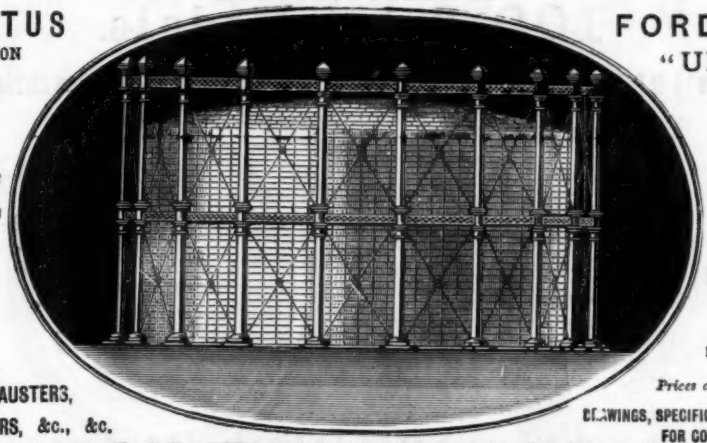

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SCRUBBER-

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Numbers at work, giving excellent results.

No Motive Power Required.

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RETORT MOUTHPIECES

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NO LUTING REQUIRED.

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WITH RACK & PINION,

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Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON

CONDENSERS,

SCRUBBERS, & WASHERS.

TAR AND LIQUOR PUMPS, &c.

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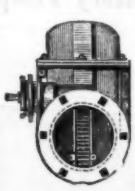
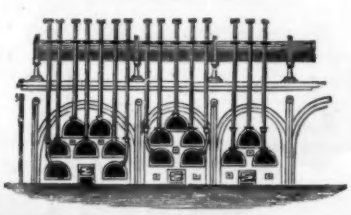
CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.





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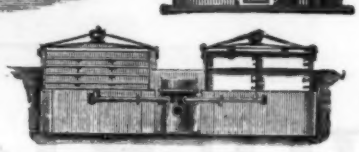

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

100 Prize Medals.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
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PUMPS
FOR
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SEWAGE, &c., &c.

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FOR THE
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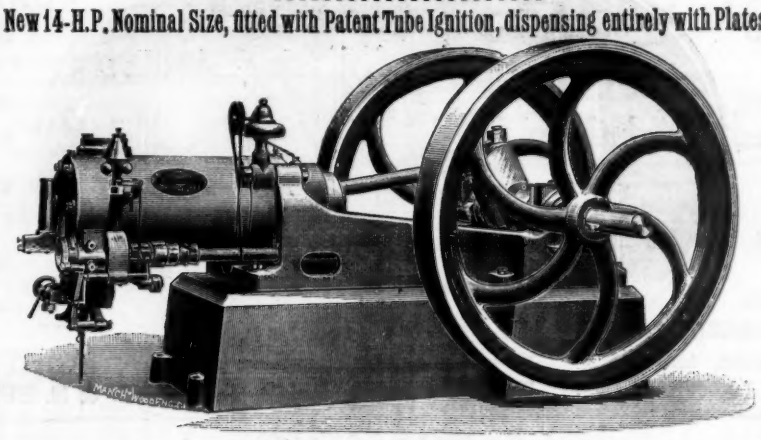
New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
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ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c. &c.

Largely used for
EXHAUSTING,
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COKE CRUSHING,
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Over **31,000** "OTTO" ENGINES are at work.

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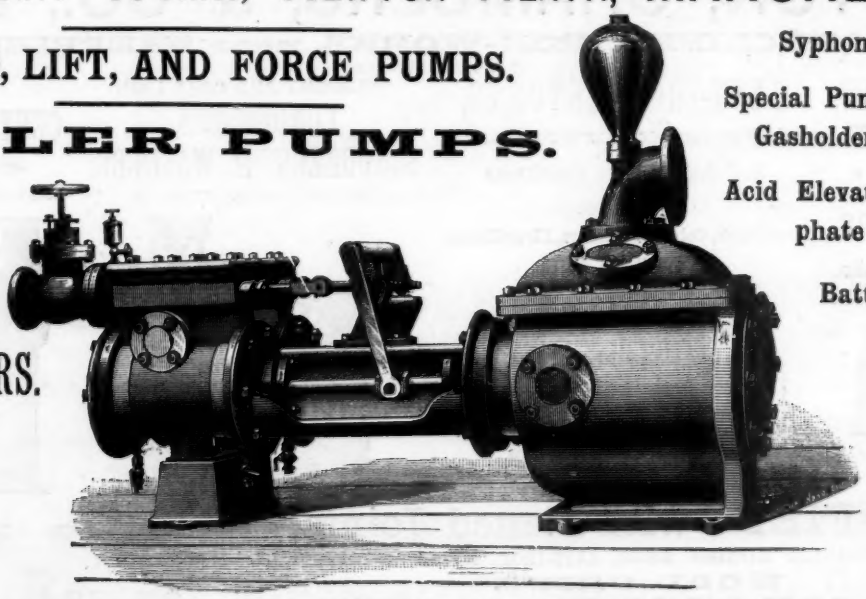
BOILER PUMPS.

PUMPS
For
SCRUBBERS.



Syphon Pumps.

Special Pumps for deep Gasholder Syphons.

Acid Elevator for Sulphate Plants.

Battery Pumps.

DUPLEX PUMPS

FOR

TAR, AMMONIACAL LIQUOR, OR CLEAN WATER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

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ESTABLISHED A QUARTER OF A CENTURY. LIMITED.

MANUFACTURERS OF ALL KINDS OF

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OF EVERY DESCRIPTION.

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GAS AND WATER PIPES

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MANUFACTURED BY THE

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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER, ENGINEERS,

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The Apparatus has been supplied to the following Firms—

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And to the following Gas Companies and Corporations:—

ILKESTON.	BURY.	CHORLEY.
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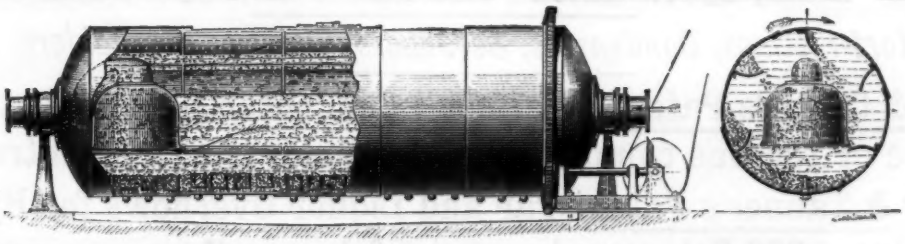
THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

By Agitation with Metallic Iron.



Made in fourteen sizes; capable of treating singly 5000 to 1¼ million Gallons per Day. Reduces Organic Matter from 45 to 90 per cent.; totally removes Microbes from Polluted Water.

A 1-inch Revolving Purifier capable of treating over 6000 gallons per 24 hours will be shown at work at the Brewers' Exhibition, Agricultural Hall, Bay 6a.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

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CLAYTON SON & Co LIMITED, LEEDS.

MAKE

RETORT LIDS

OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

JOHN HALL & CO.,

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

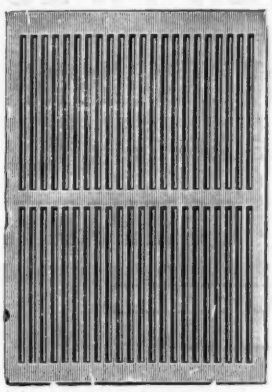
Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,

153 TO 155, CANNON STREET, LONDON BRIDGE, E.C.

R. & J. DEMPSTER'S



WOOD GRIDS FOR PURIFIERS

Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery.

Quick delivery and accuracy guaranteed.

BOARDS FOR SCRUBBERS

Cut and fitted upon the most successful system.

GRIDS FOR SULPHATE PLANTS.

Prices moderate. Inquiries solicited. Estimates free.

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GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

SULPHATE OF AMMONIA PLANT.

MESSRS. CUTLER,

Are now giving special attention to

PLANT FOR THE MANUFACTURE OF SULPHATE OF AMMONIA,

And are prepared to supply Companies with the best and most efficient Apparatus on reasonable terms.

Plans, Specifications, and Prices on Application.

Retort-Fittings, Condensers, Scrubbers, Purifiers, Gasholders, &c.

Morris & Cutler's Patent "Perfect" Condenser places the temperature of the Gas completely under the Engineer's control.

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Cutler's Patent "Simplex" (Automatic Syphon) Distributor. Largely adopted, and very successful.

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9, BRIDGE ST., WESTMINSTER.

Mr. S. HERSEY, Managing-Director.

THE "NEW" PATENT

"Standard" Washer-Scrubber,

As supplied to and in course of construction for —

The Gaslight and Coke Company, Beckton Station.
" " Pimlico "
The South Metropolitan Gas Company, Vauxhall Station.
The Liverpool United Gas Company.
Barry and Cadoxton Gas Company.
Hitchin Gas Company.
Melbourne Gas Company.
Workington Corporation.
John Brown and Co., Limited, Atlas Steel Works, Sheffield.

Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at The Gaslight and Coke Company's Station at **BECKTON,**

Resulting in a second order just received to fit up a Washer-Scrubber, of 2½ millions capacity, upon this new principle, at the same station. Other orders for these machines are in course of execution.

A very large amount of patronage has been accorded the "Standard" Washer-Scrubber, of which, up till now, **367** have been supplied, representing a daily make of **318,260,000** cubic feet of gas; but the advantages of the **"New Standard"** will be readily recognized, and its superiority over the present "Standard" may be briefly summarized as follows:—

1. The weight in motion is **only one-seventh** of that in the present machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

Particulars will be furnished upon application to the above address.

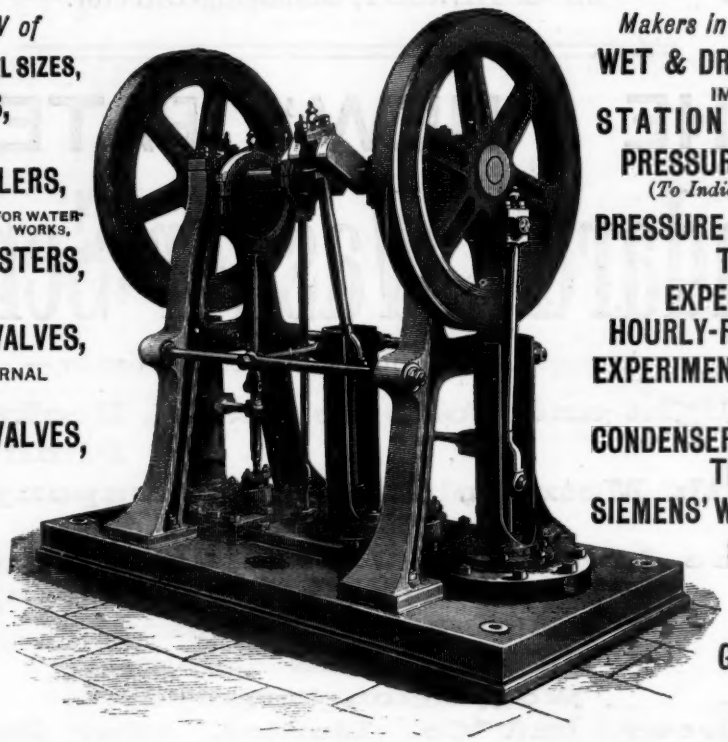
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

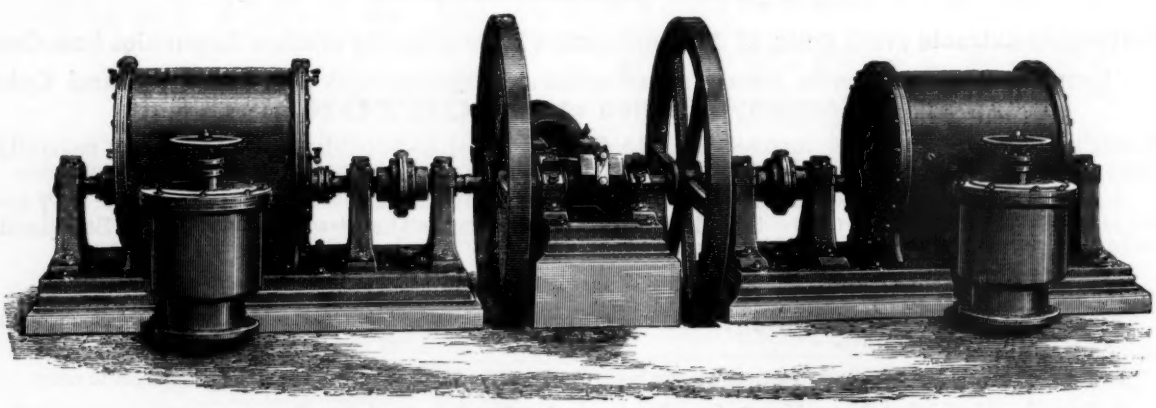
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS *(To Indicate New Time)*,
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

TANGYES LIMITED

CORNWALL WORKS, BIRMINGHAM.

LONDON: 35, Queen Victoria Street, E.C.
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PARIS: Place de la Republique.
SYDNEY: 119, Bathurst Street.
MELBOURNE: Collins Street West.

SOLE MAKERS OF THE

"SPECIAL" STEAM PUMP

FOR PUMPING

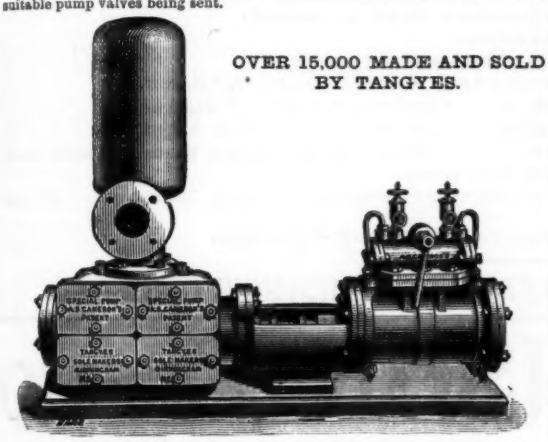
AMMONIACAL LIQUOR, TAR, & WATER IN GAS-WORKS.

Used in the Principal Gas-Works in the United Kingdom.

REDUCED PRICES.

The "Special" Double-Acting Steam-Pump is now made in some 250 sizes, and of many different designs, to suit particular requirements.
In ordering, state the purpose for which the Pump is required, to ensure suitable pump valves being sent.

OVER 15,000 MADE AND SOLD BY TANGYES.



In case of Special Quotations, the following particulars are required:—
Pressure of steam at cylinder.
Number of gallons to be raised in a given time.
The height of lift from level of water to point of delivery.
The nature of the fluid to be pumped.

The "Special" Steam-Pump can be worked by Compressed Air. For pumping Tar or Ammoniacal Liquor, the "Special" Steam-Pump is made with extra long distance piece, for which an additional charge is made.
The quantities of Tar delivered should be taken as about two-thirds those of water given below.

SIZES SUITABLE FOR GAS-WORKS.

Diam. Steam Cyl. ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl. "	1½	2½	2	3	4	2½	3	4	5
Length Stroke . . "	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.	450	1800	800	1800	3200	1250	1800	3200	5000
Diameter Suction and Delivery . . . ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price . . . . . £	9	12	11	13	15	15	16	19	22

Diam. Steam Cyl. ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl. "	3	4	5	6	3	4	5	6	7
Length Stroke . . "	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.	1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . . ins.	2½	3	3½	4	2½	3	3½	4	5
Price . . . . . £	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl. ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl. "	4	5	6	7	8	5	6	7	8
Length Stroke . . "	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.	3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . . ins.	3	3½	4	5	6	3½	4	5	6
Price . . . . . £	24	27	31	36	43	29	34	39	45

Diam. Steam Cyl. ins.	9	10	10	10	0	10	10
Diam. Water Cyl. "	9	5	6	7	8	9	10
Length Stroke . . "	24	12	12	12	18	24	24
Gals. per hour, approx.	16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . . ins.	7	3½	4	5	6	7	8
Price . . . . . £	56	32	37	42	50	60	67

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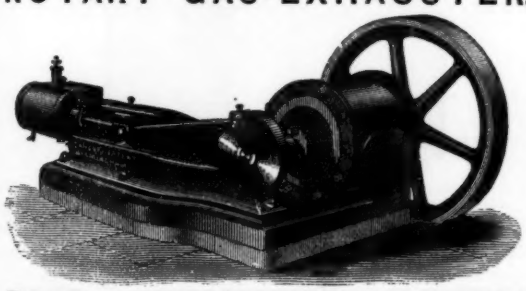
ROTARY GAS-EXHAUSTER.



These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

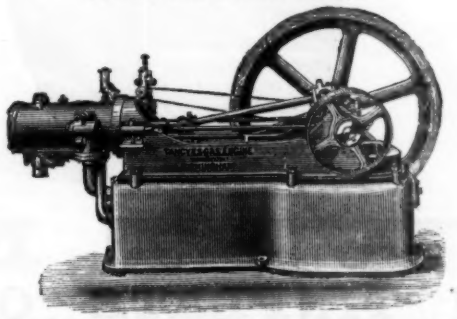
Prices of larger sizes on application.

THE "TANGYE" GAS-ENGINE

(ROBSON'S PATENT)

Royal Cornwall Polytechnic Special Gold Medal, 1882.

(Also for Gas Producer and Feed Pump.)



The ¼, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	¼ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works.

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5th—Are the most accurate and unvarying measurers of Gas.
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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 29, 1889.

THE LABOUR QUESTION.

It would be a very good thing indeed for both employers and employed if we could state that all labour troubles had been composed, and that, Union or no Union, there did not remain any source of irritation between masters and men in the gas-works of the United Kingdom. It is satisfactory, so far as it goes, to know that in a great many places reached by the wave of agitation, an amicable readjustment of the conditions of work and wages has been concluded; but this is not the whole state of the case. It is one thing for a gas manager who only has one manufacturing station to think of, to arrange the work and pay of his men to his and their satisfaction. It is quite another matter when there are two or more stations in the same town, at each of which different personal and technical considerations may have to be consulted. And if the settlement of a labour difficulty increases in a geometrical ratio with the number of distinct centres to be dealt with, what must be said of London, where, including the suburban establishments, there are upwards of two score of gas-works to be, to all intents and purposes, reorganized? It is not that the gas managers and directors interested in the matter are disposed to make difficulties, or are averse to paying their men the best rates of wages that the latter can reasonably expect from generous and prosperous employers. Quite the contrary is notoriously the case. The managers desire to see their men comfortable and contented; and the men—many of them, at least—want nothing more than they have now in the way of pay and conditions of employment. Unfortunately, no two gas-works in London are quite alike. Some are differently equipped from others in those points which strike the retort-house hands as most important to them personally; and if there is anything in one of them that the men do not like, it is duly brought before the "Branch," and then before the Executive Council of the Union, who, if they think proper, issue General Orders on the subject, which are sent round to all the works, whether implicated or not. Say, for instance—and we believe this is the latest example in point—there happens to be at one station a want of gasholder accommodation, entailing Sunday carbonizing as a tolerably regular thing. The Union Executive meet, and decide that double time shall be paid for all Sunday work between the hours of 6 a.m. and 10 p.m.; and then send notices to this effect to the superintendents of every works, irrespective of whether Sunday work is usual or not. This move is obviously made, not for the purpose of abolishing Sunday labour where it can be dispensed with, but for securing double pay for those fortunate stokers and firemen whose services are most often in demand on Sundays. We have no reason to doubt the sincerity of the workmen who profess to attach so much value to their Sunday rest; but all the same it is pardonable to entertain a strong suspicion that a good many of them, like the Scotch ferryman in the story, would not be averse to "breaking the Sawbath" for a matter of eleven or twelve shillings for an eight-hour shift. At this rate it is even conceivable that those works where Sunday labour is hardly ever heard of would not be so popular with the men as others where the opposite condition prevails. It is tolerably certain that in works where, with the humane idea of affording relief to the regular retort-house hands, such Sunday work as is necessary is ordinarily given to the yard-men in rotation, the advent of double pay would inspire the stokers with an uncontrollable desire to sacrifice themselves on the altar of duty, and so keep the yardmen in their proper inferior place.

All this sort of thing, with much more that might be stated, is being scored up against the Union officials and their system, in preparation for the day of reckoning that will surely come if the men allow themselves to be carried away by the sense of their new combined existence, and render a struggle for mastery unavoidable. This is an eventuality of which we do not care to speak lightly; but it is at least possible, although, as may be earnestly hoped and believed, improbable. It is thoroughly understood everywhere that when the next gas-works strike or lock-out takes place, if things ever come to this last extremity, it will not be in any provincial town. The example of Bristol will not be repeated; for the managers of country gas-works, however important, know perfectly well that, even if they could set the Union at defiance, they could not effectually put a stop to the vagaries of the Union leaders by breaking down the resources of the organization. We must not be misunderstood in regard to this matter. Nobody wishes to break down the Union at present, or will go one step out of the way to combat it, so long as its leaders do not overpass the bounds of fair play and legality. If they do this anywhere, it will be in London, where their strength really lies. The struggle that will ensue will be short and sharp, and if the men are victorious—well, they will be more fortunate than we expect. They have had all their own way up to now, for they have not been really opposed. This favour will not always be theirs, however, and they will show the highest wisdom in not tempting fortune too far.

It is worthy of remark that Mr. John Burns, who, not in his favourite capacity of Socialist, but as a Friend of Man, had so much to do with the London dock strike, has asserted, in his statement published in the *New Review*, that this movement originated in the contemplation of the success of the London gas stokers' agitation for eight-hour shifts. It is difficult to accept this theory as representing the whole truth. Doubtless the dockers were encouraged, and encouraged by Mr. Burns himself, with the reflection that the gas stokers before them had succeeded in obtaining what they asked for from their employers; but the circumstances of the two affairs differed so widely, that the support derived by the latter event from the former could in reality have been only of the thinnest "moral" kind. The whole point of the dockers' strike was that they wanted more money, while the gas stokers preferred less labour. Of course, movements of this nature have the relationship that comes from their

common origin in the sense of the time being proper for them. It is the state of trade that is really the cause of them all. Men of any special calling do not strike for more pay or shortened hours when they know that the labour market is gorged with superfluous hands. When the coal mines send up only half their usual output; when blast-furnaces are blown out; when the shipbuilding yards are silent, and textile mills are empty; when the bricklayer's trowel does not ring on the fringe of the town, and the shopkeeper sees the phantom of "the Court" before him wherever he turns his haggard gaze—then the labour market is quiet indeed, and nobody talks of agitations or strikes. Men regard themselves as lucky if they can only hold their own. Does anybody know how trade gets into this stagnant condition, or how it revives? Men have gone to the spots on the sun's disc for instruction in this matter; but we cannot say that they have been made much wiser. So the coke heaps in gas-works rise into mountains and melt away, nobody can tell why. The last time this phenomenon appeared, a gas manager was heard to ask a fellow-manager where all the coke was going; but the reply was a shake of the head, coupled with the self-satisfied remark that his—the inquiree's—coke had "gone too."

For all that, a season of expansion in business brings its own troubles. Nobody, it is to be presumed, would wish contraction and stagnation to be the ordinary condition of British trade. The shippers of the Port of London may grumble when their hands demand, as they consider with inconsiderate haste and painful importunity, a share of the good things that appear to be going. The Bristol traders and manufacturers may anathematize the local Gas Company for filling the mind of every wage-earner in the City with an idea of the potency of "striking" when he or she wants more money. But these things require to be looked at dispassionately. We must follow the advice of the great statesman, and "clear our minds of cant." There are many people so self-centred as to hold up their hands in horror at the notion of a strike of labourers or mill hands, who would fail to see the iniquity of the "Syndicates," makers of "Corners," and other respectable persons who combine capital instead of hands for the purpose of obtaining, in violent and sudden ways, advantages for themselves which they could not get in the ordinary way of trade. It does not lie in the mouths of many men who have enriched themselves in manufacturing or commerce to preach against the selfishness of the workman who strikes when he sees a chance of gaining anything by it. We try to avoid even the appearance of giving support to the selfish action of either employers or employed, when selfishness can be proved to exist. The principle of "Live and "let live" is for the guidance of both parties—or rather, it should be said, for the three parties into which the greater proportion of modern industry and trade is divided. There is first the capitalist, then the administrator, then the workman. We shall not quarrel with any Socialist, like Mr. John Burns, merely because he would reverse the order of this statement—putting the workman first and the capitalist last. Sequence is only a matter of form. In other words, the interests may be stated as those of money, brains, and labour. All these have their rights and also their duties. If the capitalist thinks to take everything for himself, regardless of the claims of brains and labour, he will soon either learn his mistake or lose his investment. Similarly, if the workman tries to get everything his own way, he must be taught to know and keep his place. Those who teach that any one of these parties in industry is always and invariably justified in whatever views it takes of its rights, encourage its friends in living in a Fool's Paradise. So far as our concern with the gas industry carries us into criticism of the labour question of the day, we shall endeavour to act up to the spirit of the principle cited herein, and show fair play all round.

MR. GEORGE WILSON STEVENSON.

The announcement of Mr. George Wilson Stevenson's death will bring to many of our readers vivid recollections of stirring parliamentary contests in which he took a prominent part. Many of the opposed Bills on which he was engaged for or against the promoters, were of a character not often seen now-a-days, when everything about gas legislation seems to have been settled, and no downright fight over principles is to be expected. The consideration of what Mr. Stevenson did in this way comes with special appropriateness at this season of the year, when he was wont, like the others of his craft, to be deep in consultation with promoters and opponents, as the case might be, of measures for the ensuing session. We believe it is still a superstition cherished by the remnant of the once strong band of Parliamentary Gas Engineers, that they ought to be in waiting in their offices during the month of October each year for the appointments that do not, alas! come so frequently as of yore. The present occupants of the positions vacated one after another by the "old parliamentary hands" of the profession, may well look back wistfully to the days when a "good gas bag" was sure to be opened every year, and generally more than one. It may be said with only too much point that with Spice and Stevenson has gone the business in which they were so renowned. Mr. Stevenson did not live to see any striking change in the system of Private Bill Legislation, although he had heard a great deal of talk about the subject in his time—especially, it may be remarked, since the falling off in this class of parliamentary business made reform less important than it would have been a quarter of a century earlier. Other times, other men. The corridors and committee-rooms of St. Stephen's will know Mr. Stevenson's well-remembered form no more. He did not long survive Mr. Baxter, who was an even greater *habitué* of the locality; and with the death of these two men, both eminent in their way, it is impossible not to feel that a chapter of the history of gas supply in Great Britain closes. A brief memoir of the leading features of Mr. Stevenson's professional career will be found in another column.

AN INVITATION TO ENGLISH GAS MANAGERS.

Much interest has of late been aroused among British gas engineers and managers respecting the inclined retort-setting of M. Coze, of Rheims, the object of which, as explained in another column, is to reduce the labour of carbonizing. Many professional men, when they visited the Paris Exhibition, noticed the model illustrating this invention, and some have been over to Rheims for the purpose of inspecting the action of the system in M. Coze's own works, where a setting of nine inclined retorts has been in use for a year or two. The only other place where the system may be seen at work is much farther off, at Bayreuth; and although more than one experiment in this line will be carried out in England, some time must elapse before the results of these can be ascertained. Under these circumstances, an arrangement has been made between M. Coze and Mr. Henry Woodall, who has taken great interest in the matter, for carrying out a crucial trial on the spot with English caking coals, under the inspection of any English gas engineers who care to take advantage of the opportunity for seeing the system thoroughly tested as it would be in an English works. This must be very much more satisfactory to all parties than the casual visits which M. Coze has hitherto received, when, of course, his retorts have been seen working local Belgian coal, which might or might not indicate how they would act with the more strongly caking English coals. We are therefore authorized to announce that the test in question will be in progress on Thursday of next week, the 7th prox., when Mr. Woodall will be in Rheims; and special arrangements will be made there for affording every information to English engineers. It is desired that all who intend to join the inspecting party will send in their names to the office of the Journal as early as convenient, in order that the necessary arrangements may be made. This is a novel project. But no words of ours are needed to prove the importance of the issue that hangs upon the success of this experiment; and the proposed inspection is certainly the quickest and cheapest way of testing the claims of M. Coze to have solved the problem that has baffled all his predecessors in this line.

THE "ENGINEER" ON LONDON FOGS.

There was a long article in a recent issue of the *Engineer* upon the ever-present subject of London smoke. One is prepared for occasional effusions relating to fog and smoke in the different London newspapers and magazines. But these generally appear when a fog of exceptional virulence has forced the whole subject upon the distracted attention of Londoners; and they never come to anything. Whatever appears in an engineering journal of any standing with relation to a difficulty on which amateurs of sanitation have many times spent their ingenuity in vain, should, however, be worth reading. Our contemporary pays as little heed as we are accustomed to do to the letter-writing and newspaper articles, and other ordinary comments upon London fogs; but it asks the pertinent question whether it would not be well "if sensible folk put the enthusiast on one "side for a little space, took stock of the situation, and

"endeavoured to ascertain why it is that so little has been "achieved." By all means, let us turn a deaf ear to the futilities of the Smoke Abatement Institution, and listen to words of truth and soberness on this important subject, if we can find them. To begin with, we are told reasonably enough by the *Engineer* that we must have fogs, which are inevitable accompaniments of moist air and cold. The point is that a town fog differs for the worse from a Channel mist in being charged with soot and the products of combustion. This is not, strictly speaking, the fault of the fog. Fogs must have haunted the Thames Valley—as they did the clay-pit of Manchester and the shores of the Forth—long before the first fire of fir-cones or drift-wood was lit in any of these localities by some hunter and fisherman of the Pliocene period in the world's history. We came to the fogs; and as we have always had to make the best of them because of the existence of compensating advantages in the sites where they are to be found, it seems idle to blame the climate. We should rather find fault with our own mismanagement of our atmosphere; or, if this is looked upon as too hard a judgment, we may plead that the fuel which we are obliged to use is really the offending element. If London were supplied with anthracite, or inexhaustible wood, or natural gas, its fogs would not be so black as they are now; but even then it may be questioned whether they would really be much more endurable. Our contemporary declares, indeed, that the soot is not by any means the worst ingredient in the well-recognized mixture known by the name of the "London "particular." We are told, on this respectable authority, that it is the carbonic oxide, and the carbonic acid, and the sulphurous and sulphuric acids of the town fog that are its most objectionable accompaniments; and these, of course, are not visible like the soot which gives the fog its most repelling aspect. Our contemporary says truly enough that even smokeless combustion is hopeless without close stoves; but even then the other horrors would remain. It is, in fact, asserted that carbonic oxide is produced in greater volume from a clear than from a smoky fire; but this is surely a slip. It is more to the purpose to state that if Londoners would use stoves where they now cling to open grates, the sky might be purified; but it should be added that this can only be done if the fuel burnt in the stove is less bituminous than that now generally consumed in the grate. Stoves will not make a smoky coal burn clearly; but coke and anthracite may be burnt in stoves when they would not be used in grates. However, it is so unlikely that Londoners will give up the use of open grates, that the *Engineer* is constrained to suggest an alternative course, which is no less than the construction in every street of subways for taking all the smoke from the house-fires and discharging it by means of tall chimneys! It occurs to a reader that if this is all the *Engineer* can suggest towards the sensible disposal of the smoke difficulty, little has been gained by the talk of "putting the enthusiast on one side." To do them justice, the Smoke Abatement people, in the first flush of their zeal, never put forward such a vain idea as this of the sober-minded *Engineer*. With sorrow must it be confessed that there is no hopeful remedy for London fogs, as matters stand at present. We have never flattered ourselves or our readers with the idea that any quick and easy cure for the evil will ever be devised. The nuisance has grown with the growth of our towns, until what was once peculiar to London obtains in many other busy centres of population; and its removal, if ever effected, must be similarly gradual. No heroic measures will be of any avail against an evil to which all contribute, and from which all suffer. If it is to be eradicated, it will only be in the course of time by the extension of the use of gas as fuel. Were this done even now by all as perfectly as it is done by some, the worst of the nuisance would be abated. More than this it seems idle to expect.

We have received a copy of the solutions to the questions in the subject of machine construction, set to candidates at the May examinations of the Science and Art Department, South Kensington, from 1881 to 1886, by Mr. H. Adams, M. Inst. C.E., &c., Professor of Engineering at the City of London College. The questions, in both the elementary and advanced stages, are set out in ordinary letterpress; the diagrams contained in the examination papers, with their solutions, being given on three sheets of lithographed drawings. The little book will be useful to engineering students, as showing them the kind of papers they may expect to have to "floor" when they submit themselves to the ordeal of a South Kensington examination. It is published by Messrs. Chapman and Hall, Limited, of Henrietta Street, W.C.

Water and Sanitary Affairs.

The London County Council have issued a notice calling on the West Middlesex Water-Works Company to give a constant supply of water to a portion of the parish of St. Pancras, now served by that Company on the intermittent plan. The notice includes all that portion of the parish which lies within the Company's district, except a strip of property of some extent, situated inside the limits of Regent's Park, and comprising a superior class of dwellings. Whether this omission is due to accident or design does not appear, though we may infer the latter. The annual value of these houses is probably double that of the best residences in the remainder of the area comprehended in the notice; and it seems a little odd that the occupiers should not have the benefit of that which is considered so desirable for their neighbours. Where the absolute poor are concerned, the merits of the constant supply are evident; and it was on this account that the West Middlesex Company, some years ago, at their own instance, introduced it into that part of their district which included the poorest property. Where the houses were of a better class, they found the inhabitants unwilling to have the constant supply laid on, for the reason that some change in the fittings would be requisite. The Metropolitan Board, then in existence, might have put forth their authority, and called upon the Company to give the constant supply without further parley; but they never did so—the policy of the Board on this subject being one of stolid inaction. The question arises as to how it comes to pass that the County Council have seen fit to depart from the policy of their predecessors, so as to present the unwonted spectacle of a Metropolitan Authority calling upon a Water Company to furnish a constant supply. So far as we have been able to compass the facts, the Vestry of St. Pancras memorialized the County Council to take action whereupon the Council asked the Company what they had to say upon the subject. It may be observed that the Council, from first to last, acted towards the Company with a degree of courtesy which the latter would certainly not have expected, and probably would not have received, from the Metropolitan Board. The reply of the Company was, in effect, that they had no objection to give a constant supply if their customers wished for it; but hitherto they had found this to be the case with only very few of them. After some further steps had been taken, the Council decided on giving the Company notice; the date fixed for the introduction of the constant supply being the 1st of March next. The entire proceeding is the more remarkable, seeing that when several of the City parishes some time ago petitioned the Court of Common Council to call upon the New River Company to give them a constant supply of water, the Corporation refused the request; the cause assigned for the decision being the expense involved in changing the fittings for the domestic supply. The statements made on that occasion as to the cost were obviously exaggerated, and some other motive than that of saving the pockets of the householders probably influenced the majority of the Corporation. Although the absolute inertia of the Metropolitan Board could not be commended, nor yet the carping refusal of the Corporation, it is perhaps best that the extension of the supply should be left to the discretion of the Companies. They are more in touch with their customers than the local authorities can be; and they are more intimately acquainted with their wishes. We believe it will be found that the West Middlesex Company well understand the temper of their customers in regard to this matter; and we suspect that the County Council are not quite in the dark on that point—judging by the peculiar omission of the highly-rented residences in the Regent's Park. But there is an appearance of public spirit in calling upon a Water Company to give a constant supply. Such a thing was never known in London before; and it helps to invest the County Council with an air of enlightenment. It will look as if they had put the Company under compulsion; whereas the Company are content to move, now that they can leave the *onus* with the Council. The real compulsion comes upon the inhabitants, and originates with the Vestry.

Mr. Joel has been appointed one of the London Directors of the Johannesburg Water-Works, Estate, and Exploration Company, Limited. Some account of the present position and prospects of the Company will be gathered from the report appearing elsewhere to-day (p. 841).

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 844.)

The past week has been a bad one for prices in general in the Stock Markets. In all the chief departments, there has been a greater disposition to sell than to buy. Apprehensions as to money becoming dearer have had something to do with this; but we cannot help thinking that some people are beginning to feel a little uneasy at the roaring tide of speculation which is running its resistless course. Floods of speculative undertakings—good, bad, and indifferent—are being let loose upon the public; and the ever-gullible dash into them (especially if the shares are quoted at a premium before allotment) without stopping to examine them, but only with the notion of getting out again at a quick profit. When we say "good, bad, and indifferent," we fear there are but few of the former; for it is a melancholy fact that the wildest promises of the most shameless projectors are the tastiest bait for fools, and the modest merits of a sound concern with an unspiced prospectus are overlooked. While the general tendency of prices has thus been downwards, gas securities have been particularly weak, with rare exceptions. We need not repeat what we have said before as to the character of the attack that is being made upon them, though we may renew the expression of our regret that it should succeed in frightening any proprietors out of their holdings. Gaslights have, of course, been the principal object; and all issues—except the small ones, "B," "F," and "G"—have receded. The "A" opened weak on Monday; and 249 was the best figure marked. From that point, the "bears" ran away with it every day, without a check; and on Saturday they had the satisfaction of doing it at 239½. On Tuesday, unfortunately, some parcels of debenture and preference were let go "specially" at the lowest nominal figures; and that seemed to set them rolling down hill. How much ground they lost will be seen on the list at page 844. South Metropolitan "A" and "B" are each quoted 5 lower; but the prices at which the small quantity of stock dealt in changed hands show no good reason for the fall. Commercial old is called 2 lower; but here again no business has been done. Suburbans and Provincials have no feature except that they present the almost unique instance of a rise; both Bromley issues having advanced 1. In Foreigners, Continental Unions are rather better; while Europeans are rather worse. Imperial Continental rose 2 on Monday; but fell down again on Thursday. Bombay and Ottoman have receded; but Buenos Ayres debentures are 1 higher. Water has been quiet, and has participated in the general weakness; several issues having lower quotations.

The daily operations were: Moderate Gas business on Monday, mostly in Gaslight "A" and Imperial Continental; the former falling 1, and the latter gaining 2. More activity in Gas on Tuesday; but all against Gaslights. "A" fell 2; "J," 3; and the debentures from 1½ to 2½. Oriental was ¼ lower; but Continental Union was in demand, and rose ½. On Wednesday, attention was almost centred on Gaslight "A," which fell away 1 more. "H" also fell 2¼. South Metropolitan "A" receded 5; and all Europeans were fractionally lower. The run against Gaslight "A" put it down 1 more on Thursday; and the "C," "D," and "E" fell 5. South Metropolitan "B" fell 1; and Imperial Continental lost the 2 it had gained on Monday. Bromleys, however, improved 1. Lambeth Water receded 2½. On Friday, the tale was repeated. Gaslight "A" fell 2¼; "H," 2; Commercial old, 2; and South Metropolitan "B," 2. But Buenos Ayres debenture rose 1. Water was weak too. Chelsea fell 2; and East London and Southwark, 1 each. On Saturday, the campaign was still carried on—the losses being 5 in Gaslight "J;" 1 in ditto 6 per cent. debenture; and 2 in South Metropolitan "B." Water remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

THE TENDERS FOR LIGHTING THE CITY STREETS—ELECTRIC LIGHT TROUBLES IN NEW YORK—EDISON LIGHTING IN MILAN—MORE ELECTRIC LIGHT LITERATURE.

The announcement that the Commissioners of Sewers of the City of London have decided to postpone letting the contracts for the electric lighting of the City streets will, of course, give great annoyance to the electricians; and we may expect that their journals will, in consequence, abuse the Commissioners in unmeasured terms. It must be admitted, however, that the Streets Committee have had great difficulty in arranging the terms of the proposed contracts. At first, it looked as though the whole thing was going to be a compact between the Committee and the Brush Company; but the Commission took the alarm at this prospect, and insisted on having something like competition for their favours. Then confusion became worse confounded. No two companies could be brought to submit to the same conditions. The professional advisers of the Commission (Mr. W. H. Preece and Colonel Haywood) recommended the lighting of the streets by small and thickly distributed lamps; but in the case of electricity this meant incandescent lamps, which the Committee could not afford, even if the examples of Leamington and Barnet had not warned them off this plan of lighting. Consequently, the Committee had to fall back upon arc lamps; and the proposals they finally submitted to the Commission on Monday last week were altogether different from the ideas with which they started a year ago. We have already given the particulars of the tenders finally obtained by the Committee, from which it appears that the City of London cannot get arc lamps in the streets, even under a 21 years' contract, for less than £26 per lamp per annum. The last electric lighting experiment of the Commissioners began in 1880, when contracts were made with the Brush Company, the Lontin Company, and the Siemens Company to maintain 99 arc lamps for the sum of £4390 for one year, the plant being charged for extra. Two of these contractors have since gone out of the lighting business; but the Brush Company remain. They received £660 for their 32 lamps nine years ago, or £20 12s. 6d. per lamp—admittedly losing heavily by the bargain. It served, however, as an advertisement, by the aid of which the Company launched many concessionary concerns, all of which have come to grief. After the first year's experience, the Siemens and Lontin Companies retired from the scene, and the Brush Company obtained £140 more for a second year's attempt; thus bringing up their bill to £800, or nearly £22 per lamp. As the same Company will only do the same work now for £26 per lamp, it remains for some electrical casuist to demonstrate where the recent improvement of electric lighting and the reduction of cost, of which we occasionally hear so much, come in.

A great amount of fuss is being made over the dispute between the New York municipal authorities and the electric light companies who have hitherto been permitted to run naked overhead wires all over the city at their own will and pleasure. The whole business is a fresh proof of the aphorism about "the more haste, the less speed," which Americans, in their passion for a flashy "go-ahead" style of doing things, never seem able to learn. The New York public have been for years chuckling over the rapidity with which electric lighting has spread over their city; it was such a contrast to the slowness of the effete communities of the Old World! As time went on, however, it was discovered that the hap-hazard cheap wiring to which this wonderful extension of electric lighting was due, was a great and growing nuisance. Then an agitation commenced, having for its object the placing of all electric light wires underground; but difficult as it was to get this reform voted by the authorities, it was even more so to prevail upon the electric light companies to fall in with the arrangement. Subways for the wires were constructed; but as their use would in most cases mean the sacrifice of the little profit the electricians could make out of their lighting contracts, the companies took up an attitude of dogged resistance to the ordinance directing them to put their cables underground. Months passed, and the subways remained unused, when suddenly the Mayor of New York took the matter in hand, and his myrmidons began cutting down poles and removing wires all over the city. The companies still resisted; but the occurrence of several casualties from the workmen and others coming into contact with the condemned wires, has strengthened the Mayor's hands. We wonder what Mr. W. H. Preece would say to the spectacle (detailed in another column) that recently horrified the people of New York—a telegraph lineman killed while working among the wires in the centre of the city, and his body actually burning where it hung over the heads of passengers along the street? Will he still contend, as he did at Newcastle, that the capacity of an electrical current for causing death is doubtful? At any rate, these fatalities have occurred so frequently of late in New York as to create a marked revulsion of popular feeling, which now runs as strongly against electricians and their works as it once set in their favour. The frothy and turbid stream of New York newspaper eloquence is being poured out in condemnation of the electric light companies, some of whom may perceive, now it is too late, that it would have been better for them in the long run to have made haste a little more slowly when they began their operations.

The Edison incandescent lighting of the city of Milan appears to be doing fairly well, if we may credit the statements submitted to the French Society of Civil Engineers by M. Polonceau. The experiment was started in 1882 in a disused theatre, and the plant now comprises ten Edison dynamos, all of 1000 lamps nominal and with 125-horse power engine attached, four Thomson-Houston dynamos for 30 arc lamps each, and two Ganz dynamos, for 1000 lamps each, used for theatre lighting. Nine Babcock and Wilcox boilers are in work at the station, the description of which bristles with American and other foreign names. The amount of lighting done regularly since 1887 includes 75 arc lamps in the streets, 43 arcs at the theatres, and 11 in restaurants. There are 9203 incandescent lamps in all. The Municipality pay 1000 frs., or £40 per annum for an arc lamp burning until midnight, and 1700 frs., or (say) £68, for a similar lamp burning all night. At this rate, the Company certainly ought to do very well. The incandescent lamps are charged for either by meter or on the rental system. About 60 per cent. of the lamps are only of 10-candle power, 30 per cent. are of 16-candle power, and the rest are lamps of 8 or 32 candle power. The Company prefer to charge by the Edison electrolytic meter, which is let on hire at the rate of 6 frs. yearly for a meter for 50 lamps. The charge for current varies according to consumption; but it appears to average ½d. per 10-candle lamp per hour, and ¾d. for a 16-candle lamp per hour. The Company replace all lamps the filaments of which are broken in service. It is not reported how much money the Company are making at these rates.

There have been some more articles on electric lighting in the *Daily News* since we last commented upon these remarkable communications; but they cannot be said to have advanced the question very much from the point where we left it. Mr. Crompton's Kensington and Knightsbridge experiment is duly belauded; but to show what very "small beer" this chronicler retails, it may be

stated that he explains the nature of an underground conduit to his readers by telling how a dog went into one at one surface-box and came out at another. From this display of sagacity the writer infers that, if metempsychosis is good for anything, "that dog is sure to be an electrical engineer in a future cycle of existence." One might be led to consider, from the example of New York, that the last thing an electrical engineer cares to do is to go into a culvert; but possibly the English practitioners make a virtue of the necessity, and profess to like it. Even with the dog story thrown in, however, these *Daily News* articles are not a very lively or instructive addition to the contemporary literature of electric light engineering.

INCLINED GAS-RETORTS.

Now that attention has been so powerfully directed towards the working of the inclined retort system of M. Coze, it may be profitable to discuss with some detail what there is in a system of this kind to differentiate it from ordinary methods of retort setting and working, and what these differences amount to in the practical work of gas-making. To begin with, it must be borne in mind that there is nothing new in the idea of setting a gas retort at an angle, and introducing the charge of coal at the top and drawing out the coke from the lower end. Murdoch had an iron retort of this description in use in 1804; but in relating the story of the development of the gas-retort from the primitive "pot" form to the horizontal tube finally adopted, "King's Treatise" remarks that retorts with two openings "were necessarily more easily than those having only one opening; and they were, on the whole, found more troublesome to manage and keep in order." No other explanation is offered of the abandonment of this system of retort construction; and probably no other is available, as Murdoch did not leave any memorandum stating the reasons for the progressive alterations which we know he made in the designs of his gas-making plant. With regard to the short vogue which the inclined retort seems to have enjoyed with him, it is permissible to remark that, assuming this, for the sake of argument, to be the better form of apparatus, as compared with the horizontal retort with one opening for drawing and charging, which he afterwards adhered to, this is by no means the only example in the history of the mechanical arts of a form of apparatus too good for the time when it was first introduced. The illustration of the breech-loading fire-arm may be cited as a parallel to the double-mouthed retort. It is well known that the breech-loading principle in ordnance was tried long before workmanship and material in gun-making were good enough to permit of its adoption with any surety of success. Indeed, it is the most obvious way to use a tube, whether for the continuous or intermittent reception and conveyance of material, to feed the substance in at one end and pass it out at the other; but, as we see, considerations arising out of the construction and working of apparatus modify first principles. We may be sure of one thing—that whether or not the "Treatise" account of the reason for the abandonment of the inclined retort by Murdoch is complete, he must have had good and sufficient reason for his action in this matter. We may believe, if we will, that he gave up the idea of taking advantage of the effect of gravity in charging and drawing gas-retorts because inclined double-mouthed retorts were too dear and troublesome to keep tight; or we may incline to the opinion that he found some more serious objection to their use, the nature of which we may gather from later experience not quite passed out of mind.

On the other hand, it is but right to allow that coal carbonization in Murdoch's time was only carried on in the small way; and therefore the choice between taking all possible advantage of the effect of gravity in dealing with retort charges, and lifting every particle of coal, laying it on the bottom of the retort, and drawing the coke by manual labour, may not have struck him as sufficiently important to warrant any great effort in overcoming the drawbacks, such as he found them, of the inclined retort. However this may have been, the fact remains that when the elaboration of gas-making plant passed from Murdoch's hands into those of Clegg and his immediate successors, the inclined retort dropped out of sight, and improvement was sought in far more complicated and irrational devices. Brunton's discharging retort, patented in 1835, and tried on rather a large scale at West Bromwich, is spoken of as the next practicable system of inclined retort-setting; but the description is scarcely correct, as the sole of the retorts was very little inclined—merely sufficient to give ease to the operation of pushing out the coke from the front to the back, where it fell into a water-sealed pan. The chief feature of this plan was the frequent charges; and there seems to have been something in it, although evidently the advantages were outweighed by the drawbacks—probably expense of construction and restriction of the size of retorts capable of being worked in this way. All this, of course, belongs to the "iron age" of carbonization, before clay retorts had profoundly modified the conditions of the problem.

With the advent of clay retorts came the desire to increase the quantity of gas made per unit of retort-house area; and settings became multiplex. The time arrived when the reduction of the labour of charging and drawing so many retorts occupying such a limited space received much attention; and mechanical stokers, vertical retorts fed automatically, and inclined retorts fed by hoppers, occupied the thoughts of progressive gas engineers. For many reasons the system devised by Mr. W. T. Carpenter, of Sheerness, and described by him before the British Association of Gas Managers in 1878, may be taken as the best suggestion of the second, or "clay-retort age" of gas making, before the age of gas firing came in to render practicable many things previously impossible. In Mr. Carpenter's system, the coal was made to enter the retort by means of a screw working in the mouthpiece, which received the charge continuously from a hopper, and forced it onward. The interior diameter of the retorts was greater than that of the mouthpiece; and the idea was that the coal would swell and intumesce very speedily after coming into the mouth of the retort, and that while travelling to the back it would part with nearly all its gas. The ends of the retorts were open, and overhung a chamber into which the coke was intended to fall, and be periodically taken out. Ultimately, we believe, this enclosed coke vault was dispensed with, and the back ends of the retorts left exposed, for more convenience in getting out the coke. It appears that the difficulty here was the packing of the coke towards the back end of the retort. It would not fall out or clear itself as designed; and, moreover, the consumption of fuel with such a setting must have been excessive.

The first mention of M. André Coze's plan of inclined retort-settings was on the occasion of the meeting of the Société Technique de l'Industrie du Gaz en France at Bordeaux in 1885. Upon this occasion, M. Coze read a paper in which he maintained that the problem of the rapid and easy charging and emptying of gas-retorts might be solved by having regard to the natural angle of repose of the raw material. He described his setting of retorts designed in accordance with this principle, wherein the floor of the retorts had an angle of 29° with the horizontal, at which he found that coals would rest. The charging was done by tipping a specially-designed scoop into the superior opening of the retorts, where it was turned vertically upwards, and the charge was prevented from falling down too far, so as to clog the lower mouthpiece, by means of a moveable stop. The good working of these retorts was certified by M. Cornuault. In the following year, M. Coze again brought the subject under the notice of the Société Technique, when he claimed that at the right angle of inclination, which he then stated as being 30°, any sort of coal—rough, small, or through and through, dry, or as damp as it ought to be carbonized—would stand equally well in his retorts. The perfected setting was heated by a gas generator furnace. In the discussion of M. Coze's paper, M. Ellissen remarked that the Paris Gas Company had tried inclined retorts in 1849, and cited the experience of Glasgow in 1881. All this proved, according to him, that the inclination of the retorts ought to vary from 26° to 42°, to suit the different classes of coals met with in ordinary retort-house working. M. Coze contended that he had not arrived at the angle of 30° for his retorts without plenty of experiment; and that whatever might have been the causes of the earlier failures, with which he had no concern, he was in a position to prove that the one angle given was correct for every variety of coal used for gas making. He argued that several factors go to make the success of his system. In the first place, there is the angle of inclination; but this is supplemented by the form of the retort—a flattened ⏢—against the roof of which the larger lumps strike when they rebound from the shock of tipping the charge. The form and disposition of the charging scoop or waggon which tips the whole charge at once into the retort, is another factor. Thus we see that the Coze system differs from all that have been described hitherto, in being a combination of (1) generator firing with (2) flattened ⏢ retorts inclined at 30°, (3) charged periodically by a tipping-scoop, and (4) drawn by hand from the lower mouthpiece. It appears from this description that M. Coze has in fact succeeded by not attempting too much. If, like Mr. Carpenter, he had complicated his design by the addition of an automatic continuous-action charging device, it is quite possible that all would have gone wrong together. As it is, the problem of success depends wholly on the spreading of the charge evenly over the floor of the retort; and this, we are informed by eye witnesses, is done in a style that the best hand-charging of horizontal retorts seldom equals. If this result can be depended upon for any length of time, whether the retorts are clean or clogged with carbon within reasonable limits, and with any variety of coal, and if the lower end of the retort is never likely to become plugged with a mass of coke when the strongly-caking North of England coals are carbonized—then there can be no manner of doubt that the Coze system has a future before it.

What the Coze system is we have endeavoured to explain, and need only refer to previous statements in the JOURNAL*, to make the description complete. What it does can scarcely be stated in full until the system has been tried on a sufficiently large scale to be compared with the work of an ordinary scoop gang in a well-organized English gas-works. Here, as we are accustomed to believe, coal carbonization by manual labour has attained its greatest perfection; and with this standard, all proposed improvements must be compared. Circumstances which need not be gone into now have arisen to make it desirable that any system of retort-working which is only as good as that of scoop charging should be attentively considered, provided that it attains the desired end by means which are a change from the ordinary methods. It is not clear that the Coze system would make any noteworthy difference in the number of men required for the work of carbonization; although it is impossible to speak definitely upon this point until it has been fairly tested on a considerable scale, with the advantage of mechanically elevated coal. In any case, however, the character of the works will be different. Little training will be needed for the manipulation of the charging-scoops, which make but slight demands upon the strength or dexterity of the

* See Vol. XLVI., p. 198; Vol. XLVII., p. 25; and Vol. XLVIII., p. 189.

men who handle them; and the drawing is reduced to merely encouraging the coke to fall out of the retort by its own weight, by introducing a tool like a light "slice" between the first lumps and the retort. The work of the trained stoker is consequently greatly reduced, and should fall within the powers of any able-bodied labourer. What this means, British gas managers may be left to define according to their particular experiences.

It does not fall within our province to state precisely how much of M. Coze's design is new and original. The principle of the inclined retort is, of course, as old as the gas industry itself; but the point to be considered is that it has always failed in application before this attempt. Hence it may be supposed that M. Coze—assuming his method to prove universally successful—must have improved the arrangement in some way or other. Any gas manager in the kingdom may easily test his claim of the sufficiency of a slope of 30° for all kinds of coal, by putting up a length or two of retorts at this inclination in the yard, and tipping a barrowful of coal into the upper end, with due regard for M. Coze's precautions. This little experiment will not go very far, either to prove or disprove M. Coze's pretensions; but it may lead to more important trials. The whole subject of facilitating the working of retorts is now very much to the fore; and anything that may tend to arouse and sharpen interest in the problem should receive proper attention. We have no wish to claim any more for M. Coze than is his due; and still less do we suppose that he has said the last word on the subject. Until somebody brings forward a better device, however, it is only fair to admit that the Rheims Gas Engineer occupies the field; and no apology is therefore needed for devoting special notice to the nature and prospects of his system of carbonization.

Society of Engineers.—At the ordinary meeting of this Society to be held next Monday, Mr. S. Griffin will read a paper on "Modern Gas-Engine Practice."

Asbestos Sealing for Retort-Lids.—With reference to the "Note" on the above subject in the last number of the Journal, Messrs. Westwood and Wrights, of Brierley Hill, call our attention to the fact that the system described by M. Laurain to his colleagues of the Société Technique is the one for which they took out a patent in June last year, as described in the Journal for May 7 last. M. Laurain spoke of the arrangement in terms of commendation; and we learn that it is in use in several gas-works, giving great satisfaction.

Australasian Gas Association, Limited.—The Direc tors of this Association, the formation of which, about two years ago, was noticed in the Journal at the time, are about to issue 5000 of the 22,000 shares still unallotted. They are £10 shares, and on those already issued an interim dividend at the rate of 6 per cent. per annum was paid in April last, and one at the rate of 7 per cent. has just been declared for the second half of the year. The Association have acquired four Australian gas-works—viz., those at Benalla, Shepparton, Wangaratta, and Warragal, all in Victoria—as well as an interest in the Charters Towers (Queensland) Gas Company; and there are several works in the Australian colonies erected with local capital, which may be acquired by the Association on favourable terms.

Changes in the Management of the Great Yarmouth Gas Company.—After nearly half a century's service, Mr. W. H. Willis, who for close upon forty years has filled the position of Secretary of the Great Yarmouth Gas Company, has been compelled, on account of ill-health, to relinquish active work. His resignation was accepted by the Directors with very great regret; and he retires with the warmest wishes of a large number of friends. Mr. Charles Panchen, who was associated with Mr. Willis for about 27 years, has succeeded to the office so long and so ably filled by his respected chief; and he entered upon his duties on Monday last week. Coincidentally with the change in the secretarial department, the Directors appointed Mr. W. J. Carpenter, Assoc. M. Inst. C.E., Engineer and Manager of the works.

The London County Council and Overhead Wires and Subways.—The London County Council contemplate the promotion of a Bill to obtain powers in regard to overhead wires and subways. They wish (among other things) to compel owners of existing wires to register them, with route plan and other particulars, at the office of the Council within twelve months of the Bill becoming law—the register to be corrected annually; to require, in the case of new wires, plans to be submitted for approval of the Council before erection; to prescribe that wires be carried underground; and charge a fee for the annual registration. With regard to subways, power is to be asked to construct them; to compel owners of gas and water or other pipes and wires to use them, and to remove existing pipes and wires into them; to charge rent for their use, and grant the use of them free for a given period as compensation in cases of compulsory removal; to call upon gas and water and other companies to supply plans and full particulars of any pipes, wires, or other works belonging to them in any streets along which it may be suggested that subways should be laid; to call upon such companies to deposit plans and obtain the approval of the Council for any proposed alteration, renewal, extension, or addition to existing pipes, wires, or works in any thoroughfare or street; to remove all disused pipes or works in public streets; and to make regulations for the use of the subways. Doubtless the Metropolitan Gas and Water Companies will have something to say as to these proposals when they are duly formulated.

GEORGE WILSON STEVENSON.

A well-known name, familiar as a "household word" in the mouths of the present generation of gas engineers and managers, has dropped out of the list of the living, with the decease, on Wednesday last, of George Wilson Stevenson. The event had been impending for a year or more, during which time Mr. Stevenson had been unable to attend personally to the extensive consulting and parliamentary practice carried on by him in partnership with his third surviving son, Herbert, in Parliament Street, Westminster. Death came at last, without suffering, as the result of extreme weakness from defective heart-action. For upwards of thirty years Mr. Stevenson took a leading part in all important parliamentary gas engineering business; his success as a witness before the Committees being due not only to his wide experience, but also to his suave manner and unfailing tact. He was a bright example of success in a difficult and exacting calling, worked and waited for through long years of persevering labour. Born in 1825 at Derby, where his boyhood was spent, at the age of seventeen he became one of Mr. Hawksley's first pupils at Nottingham. Nothing worth chronicling happened to the young Engineer until his marriage at the early age of twenty-two, when he went to the United States, and there for a little more than a year engaged in miscellaneous engineering work. Not liking the country or the conditions of his life there, he returned to England; for some time practising his profession in the neighbourhood of his old home in Derbyshire. This did not last long. He next became Surveyor to the Loughborough Local Board; and, as a water and sanitary engineer, entered in 1850 into partnership with the late Mr. William Lee, a member of the Board of Health, which preceded the Local Government Board. The partnership was dissolved in 1855. Mr. Stevenson in the same year took an engagement under the Halifax Corporation, as Borough Engineer; and here, among his general civil and sanitary engineering work, he undertook his first notable gas business in connection with the acquisition by the Corporation of the local gas undertaking. Mr. Stevenson was the adviser of the Corporation through all this transaction, which was a very celebrated affair at the time; and in his two-days' cross-examination before the Committee on the Bill, he laid the foundation of his reputation in this line. After the works passed into the hands of the Corporation, Mr. Stevenson practically rebuilt them throughout. This success brought him a good deal of consulting practice, to attend to which exclusively he left Halifax in 1866, and settled in London. Since this period he has been concerned with all the best-known consulting gas engineers of his own and the following generation in a vast number of parliamentary, arbitration, and general consulting cases. During the past ten years alone he was retained by upwards of 200 local authorities and gas companies—several times over by some of the number—and was, in short, regarded as indispensable for important cases as long as he was able to carry on the work. His spare, fresh, almost youthful-looking figure, on which years seemed to have no depressing influence, was constantly to be seen in the Committee-rooms where precedents were being manufactured and the conditions of gas supply settled. His experience in parliamentary practice qualified him in a very special way for the production of his "Precedents in Private Bill Legislation affecting Gas and Water Undertakings," which was published in 1879. Among his last engagements was the Edinburgh gas transfer, and the purchase by the Wakefield Rural Sanitary Authority of their portion of the Wakefield Corporation water undertaking. Besides his parliamentary employment Mr. Stevenson built new gas-works at Scarborough and West Bromwich, and did a great deal of design and construction work at Colchester, Runcorn, Malton, and many other places at home and abroad. He was President of The Gas Institute in 1882. Mr. Stevenson leaves a widow, and four sons, all of whom are engaged in the profession of gas engineering—a circumstance which we are justified in characterizing as unique. He was buried yesterday in Paddington cemetery.

DEATH OF MR. JOHN REID, OF EDINBURGH.

In Mr. John Reid, who died last Wednesday, at his residence in Leith, the gas industry has lost one of the champions who fought for it when it was a growing power, and the fruits of whose labours are being reaped by their successors. It is eleven years since Mr. Reid retired, on account of ill-health, from the position of Engineer and Manager of the Edinburgh and Leith Gas Company; but the tide of events flows so fast now-a-days that in this short space of time his name had almost dropped out of remembrance. Yet his record is one which should not be forgotten. His father was Engineer and Manager of the Perth Gas-Works, and was the first man in Scotland to introduce fire-clay retorts. He himself served an apprenticeship to the engineering trade in Dundee; and, after spending some time in England and Holland, was appointed to the managership of the Montrose Gas-Works. In 1860 he became Engineer and Manager to the Edinburgh and Leith Gas Company, and began the course of prudent management which, continued by his successors, led to the Company holding the high position it occupied when the transfer was effected. Mr. Reid's leanings were towards the engineering side of his profession; and in this connection his principal work was the devising of a rotary washer, which was the pioneer of the revolving washer-scrubber now extensively used, and which, in point of fact, is at present in operation in the Leith Gas-Works. Mr. Reid was of a literary turn of mind, and both before and after his retirement was in the habit of contributing papers to scientific societies, upon subjects connected with

his profession. He will also be remembered by some of our readers as a Past-President of the North British Association of Gas Managers. It was characteristic of him that, when he felt he was no longer able to take an active part in the affairs of the Association, he was anxious to retire from its membership. The subject, it will be remembered, was mentioned at the meeting in Dunfermline last summer, when the Association, unwilling to sever their connection with him, and in recognition of his services, transferred him to the list of honorary members. An old and esteemed friend of the deceased gentleman, who was the oldest gas manager in Scotland, has kindly furnished us with an interesting biographical notice of him, which will appear next week.

GAS EXHIBITS AT THE AGRICULTURAL HALL.

The Brewers' Exhibition at the Agricultural Hall last week would have been robbed of its adornment, if gas engineers had held aloof. Of course, they were unable to do so, because gas participates in the list of attractions that make hotels and restaurants so gay and alluring. What would a public-house be without its massive gas-lamps, its hundred-and-one burners, its bright shining bar-stoves, or even the humble muller. No wonder, then, that our principal gas engineers came forward, and made a display that in itself constituted one of the features of the exhibition. Again, the motive power for driving brewing-machines was derived from some of the many gas-engines in the market. In this matter no less than five gas-engine manufacturers vied with each other to excel in their particular trade. Undoubtedly the gas-engine exhibits were very fine; and beyond the mere fact of the show, they were utilized for purposes of bottle washing, electric lighting, &c. We noticed particularly on the ground floor, near the main entrance, the exhibits of Messrs. J. E. H. Andrew and Co., of their "Stockport" engine. A special feature was made of a 14-horse power one, with double-action cylinders at each end, giving two explosions at every revolution. This engine was driving ten 2000-candle power arc lamps with a steadiness that was simply surprising. The same firm also showed a 4-horse power gas-engine which was working the bottling apparatus of Messrs. Barnett, Foster, and Co. Then, a 1-horse power engine drove one of Burge's bottle-washing machines; and in other parts of the building four small engines were in use for various purposes. Alongside was the Atkinson patent "Cycle" gas-engine, which has obtained a gold medal at the Inventions, and a silver one at the Edinburgh Exhibition of 1886. In addition to these, the British Gas-Engine Company were running one of their 2-horse power Cycles, which drove a dynamo for sixteen incandescent electric lights. It seems that the Company only require to push their appliances into the market, and success will be certain. In the passage-way near the entrance to the Hall stood two of the "Campbell" gas-engines, of ½-horse and 2-horse power. We understand that the proprietors of this engine are making a very fine one of 20-horse power for Ireland. The firm, give publicity to the fact that they gained the highest award at the recent Birmingham Electrical and Industrial Exhibition. Messrs. Crossley Bros., Limited, at their stand were driving five engines, from 5-man to one of 3-horse power. As usual, their exhibits attracted a great deal of attention. Next and last of the gas-engine makers came the firm of Messrs. Dick, Kerr, and Co., of London and Glasgow, the manufacturers of the "Griffin" engine. We inspected with much satisfaction a 4-horse power double-action engine, the special feature of which was the double explosion in one cylinder. There were also three smaller engines driving a pump and two dynamos for eight arc and incandescent lights.

Leaving the gas-engine department, we passed to the general exhibits of those connected with the gas industry. Mr. Heron, of Birmingham, was discoursing on the advantages of his patent duplex gas-burners; claiming for them a saving of 33 per cent. of gas while giving 60 per cent. more light. Allied with gas came an exhibit of the "sphincter grip" armoured hose—rubber tubing surrounded by a spiral wire coil, but in such a way that a 50-feet length could be coiled up into a ball without kinking. For gas purposes, where tubing to stoves is laid about the floor, the "sphincter" is a preventive to being suddenly trodden upon and the supply stopped. With regard to lighting appliances, at stall No. 155, the Wenham Company showed a large selection of their patent gas-governors, louvre ventilators, Leeds heating-stoves, and automatic water-boilers. A feature of this show consisted of several new clusters—chandeliers with from 5 to 10 lights, but all on the Wenham principle. The combination of so many small soft lights had a very pleasing effect. The "Meteor" gas-lamps, of Messrs. H. Greene and Sons, were greatly admired. The assortment consisted of a variety of outside and billiard-table lamps. The "Meteor" lamp is adapted to burn in the open air by means of a covering or case fitted to the outside of the lamp. Messrs. H. Turner and Co. had fitted up various tints of their coloured lamp-shades, giving a pretty effect to their glass stall. In and around the building we noticed that stallholders were freely using the patent "Thomas" lamp, manufactured by the Thomas Lighting Company. In every case they gave the greatest satisfaction. Ascending the gallery, we first of all inspected with a great deal of pleasure the excellent stall of Messrs. W. Sugg and Co., Limited. Here there was plenty to interest the gas trade as well as the public. Of course, a feature was made of the "Cromartie" gas-lamp, regulated by a Sugg patent gas-governor. Since the Health Exhibition, nowhere has this lamp been admired more than at the Breweries' Exhibition. Since that time it has been greatly improved, and is now adapted to the requirements of domestic, shop, and warehouse lighting. The Maltese model which consumes 4 cubic feet of gas per hour, gives an illuminating power of 45 candles. The incandescent lamp of Messrs. Wentworth has received valuable testimony from the National Safe Deposit Company, who state they have saved £30 in a year by their use. This lamp was awarded a silver medal at the Paris Exhibition. Messrs. Wentworth made a feature of their Welsbach lamps, giving a light equal to 20 candles, and effecting a saving of 60 per cent. over the best form of Argand burner. The Champion Gas-Lamp Company made a very fine show of their patent lamps. There is claimed to be perfect combustion in this invention, and a circulation of heated air generated. At stall No. 7, the well-known Stott gas-valve and governor were exhibited.

We have now to notice the exhibits of gas-stoves. Messrs. John Wright and Co. made a good display with their heating and cooking appliances; while the various stoves on view at the stand of Messrs. W. Sugg and Co., Limited, included the "Charing Cross," "Métropole," gold medal "Dweller," and the "Bruxelles," the last of which took the gold medal at the Paris Exhibition. Messrs. Hunt and Co. showed a fine assortment of stoves; as also did Messrs. Clark and Co., who gained much public notice of their "Syphon" gas heating-stove. They give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. Messrs. Loftus, the well-known public-house fitters, exhibited several new designs in bar-stoves and mullers. Passing round the gallery to stall No. 18, we found a very large and varied show by the Wilson Gas Engineering Company. Their latest invention is a gas cooker with no gas inside the oven, abolishing the slightest fear of gas taint. The pastry oven, the bakers' oven, and the improved gas roaster, were on view; and amongst the sales, one of these had been bought by the Hornsey Gas Company. Our next inspection was that of Messrs. Hersey Bros., who made a splendid show and did good business with their Wenham lamps, gas-governors, water-boilers, carving-tables, and the assortment of stoves by Messrs. Arden Hill and Co., of Birmingham. A novelty in the exhibition was the "Boudoir" gas-stove at the stand of Messrs. Terraneau and Co. This stove has a regulated atmospheric arrangement, and blends the air with the gas as required. The outside frame encircles the burner; and the bars being apart, allow of the heat generating freely. They consume 7 feet of gas per hour, equal to 1½d. per day. One of the "Boudoirs" was employed heating water at the Bovril counter. At the Leoni stand, upwards of 30 stoves of the Harden Star Company were on view. These stoves created much admiration. A novelty by Leoni was a patent folding stove, allowing for it to be taken to pieces for removal with freedom. Messrs. Freeman, Emery, and Co. exhibited a selection of the new "Beacon" cookers, and several grilling, boiling, and heating stoves.

Altogether the gas exhibits were a credit to the various firms engaged; and the success of the Brewers' Exhibition has induced many of them to enter the Cookery Exhibition, which is to be opened at the Hall on the 4th prox.

The Water Supply of Paris.—The Paris Municipal authorities have lately completed, on the southern crest of the hill of Montmartre, a new water reservoir which will prove to be of great value in maintaining the supply to the city. It has a capacity of 15,876,000 gallons, and is formed in three superimposed compartments—the top one being intended for spring water, the middle one for river water, and the lower one as a reserve in case of accident. The river water is drawn from the Seine, at a point near the Pont d'Austerlitz, by pumps of 800-horse power, and conveyed to a tank at the foot of the hill, whence it is raised by pumps of 500-horse power to the reservoir.

The Coal Resources of Persia.—About 18 years ago the coal resources of Persia were stated by Sir C. Macgregor, in his "Gazetter of Central Asia," to be restricted mainly to two places—near Shahrod and the village of Hir, north-west of Teheran. More recent surveys, however, have shown that the supply is not restricted to a few places; but that the quantity is practically unlimited, and that at the pit's mouth it can be produced and sold for 5s. or 6s. a ton. At present coal is only worked at Hir, which is 40 or 50 miles from the capital, where the output each year is 15,000 tons. In the Elburz Mountains as many as 25 separate mines are known to exist; but they have only been exploited by villagers in a rude and primitive manner. In south-west Persia, from Ispahan to the hills north of Bushire and westward as far as the Karun, numerous coalfields have also been discovered.

Awards at the Birmingham Electrical and Industrial Exhibition.—The Jury of the Electrical and Industrial Exhibition at Bingley Hall, Birmingham, the opening of which a few months ago was noticed in the Journal at the time, have issued a list of awards which they recommend to the Committee of the exhibition. Among them we notice the following:—First-class silver medals: The Campbell Gas-Engine Company, for gas-engines; Messrs. Piercy and Co., for the "Griffin" gas-engine; the Lucigen Light Company, for their lighting apparatus; Messrs. Arden Hill and Co., for gas-stoves, &c. First-class bronze medals: Messrs. Barker and Co., for a gas-engine for electric lighting; Messrs. Freeman, Emery, and Co., for gas-stoves and appliances; Messrs. Hargreaves and Bardsley, for gas-governors; the Incandescent Gas Company, for gas-burners; Mr. H. S. Muller, for the "Alpha" automatic gas-machine and gas-extinguisher; Messrs. Stott and Co., for gas-governors; the Defries Oil-Lamp Company, for oil-lamps.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXI.

According to a Canadian magazine, an inventor in that territory found that good results could be obtained by using a mixture of two-thirds pine wood and one-third bones as a gas producing material.* It is possible that some kinds of bones may contain sufficient grease or oily matter to enable them to yield high-quality illuminating gas on distillation. But their capabilities in this respect have never proved sufficiently tempting to lead to their use whenever other materials can be obtained. This process was worked on a small commercial scale at the town of Coburg; and it was found that the product from 33 cwt. of pine wood, and 10 cwt. of bones, together with 16½ cwt. of hard wood used for fuel, was 15,000 cubic feet of gas, 40 bushels of charcoal, 770 lbs. of bone black, and other substances. The cost of the materials was about 35s.; and the gas was sold at 8s. 4d. per 1000 cubic feet. But it was claimed that the residual products more than paid for the cost of the materials and labour. This process, therefore, should be highly lucrative whenever anything like the prices just named are found to obtain.

In 1881, a bone-gas process which resembled the foregoing in respect to the claim that it could be worked at a profit, independently of the yield of gas, was patented by Herr Richter in Germany. It is certainly a matter of surprise that processes possessing the very desirable feature, from a commercial point of view, of having the working expenses represented by a minus quantity, should attract so little attention, or be adopted to such a trifling extent. In Richter's process the bones or any other animal refuse are saturated with potash solution and allowed to dry. The resulting material is carbonized in the usual way, yielding gas, liquor, and tar. The residuum in the retort is treated for the recovery of various valuable chemicals; and the excess of potash is also recovered, and can be used for the treatment of fresh supplies of material. Bone contains about 70 per cent. of mineral matter, chiefly phosphate of lime, and the remainder consists of organic matter including hydrogen and carbon, but also appreciable quantities of nitrogen and oxygen. These last two elements are highly objectionable in any gas producing material, as likely to combine with the hydrogen, thus hindering the formation of those hydrocarbons that are such an indispensable feature in illuminating gas. On this account the products from bone distillation may be expected to yield large quantities of ammonia and similar bases, together with water and other oxygen compounds. The residue in the shape of permanent gas cannot be very great. The unsuitability of bones as a gas producing material may be further illustrated by likening them to a very impure shale or peat, containing 70 per cent. of ash and only 30 per cent. of organic matter.

If this is the case as regards bone, it would appear that the prospects of refuse matter, such as sewage, &c., would be still less promising. Yet many inventors have come forward with sewage gas schemes, though in most cases the cost of drying, &c., must necessarily render the material costly. For it is, of course, understood that the gas-yielding value, such as it is, rests with the solid residue, which must first be separated from the large quantity of water which serves both as a diluent and as a carrier. In addition to such hydrocarbonaceous matter as may be due to animal excreta, ordinary town sewage will contain variable proportions of fatty or oily matters, due to the use of soap, to grease, and various other causes. It is indeed probable that substances of this kind are chiefly concerned in yielding illuminating gas when the dried sludge is subjected to destructive distillation, rather than the excreta, which consists almost entirely, after the separation of the water, of matters rich in nitrogen and oxygen.

A statement in the *Journal für Gasbeleuchtung*, published some 15 years since, gives particulars of a process worked by Herr Sinderman.† It is said that 100 lbs. of excreta, distilled by the consumption of 50 lbs. of coal, are found to yield about 140 cubic feet of gas which burns with a whiter flame than ordinary coal gas, 7 lbs. of charcoal (useful as a manure), 8½ lbs. of tar, and 3½ lbs. of fat, besides a quantity of ammoniacal liquor. This process could only be applied in towns where the tub system was in use, or some other plan adopted for keeping the excreta separate from waste and storm waters, &c. A town of 20,000 inhabitants would yield something less than 3 tons of excreta per day, or only sufficient to afford less than 10,000 cubic feet of gas. To distil this quantity, 1½ tons of coal, or the equivalent in coke, would be required; so the cost for fuel alone would be at least 1s. per 1000 cubic feet. The yield of residuals is very small; and the proportion of sulphurous and other impurities to be removed would certainly be large.

A little later on a statement went the round of the newspapers to the effect that a process by which ordinary town sewage used in conjunction with oil or petroleum in the proportion of one pint of oil to one gallon of sewage, was made to yield 500 cubic feet of 22-candle gas.‡ The liquids were fed continuously, drop by drop, into iron tube-retorts maintained at a red heat. It is easy to show that this statement was unreliable. The weight of the two liquids would be about 11 lbs.; the weight of 500 cubic feet of air is nearly 40 lbs.; and the specific gravity of a 22-candle gas would not be less than 0·5. From this it appears that a yield of nearly 20 lbs. of gas is claimed from 11 lbs. of materials. The pint of oil would yield about 12 cubic feet of oil gas. A gallon of pure water contains 1¼ lbs., equal to about 230 cubic feet, of hydrogen; and a gallon of town sewage would not contain an appreciably greater quantity. So that if we assume the temperature and length of the iron tubes as sufficient to secure the complete decomposition of the liquid into the lightest possible gas, only about half the bulk of gas claimed can be made up. In this process, the main reaction relied upon for the production of the bulk of the gas is the decomposition of water into its elements, and the absorption of the oxygen by the metal, which would soon destroy the tubes. Apart from this consideration, it has already been shown that processes based upon the decomposition of water or steam in closed retorts heated externally, are never likely to succeed in practice.

Another system that has attracted some attention, notwithstanding its obvious impracticability, is that of generating free hydrogen by the action of acids or steam upon metals, thus producing a non-luminous but powerful heat-producing gas that can afterwards be carburetted in any convenient way. Probably the cheapest metal for use in this manner would be iron. And if we assume it to be completely oxidized by the action of steam, the result would be as follows:—

$$2\,Fe + 3\,H_2O = Fe_2O_3 + 3\,H_2.$$

According to this reaction, for every 3 lbs. of hydrogen produced, no less than 112 lbs. of iron would require to be oxidized. The bulk of 3 lbs. of hydrogen is about 570 cubic feet; so that about 1¾ cwt. of iron would be required for each 1000 cubic feet of gas. This is quite sufficient to show the absurdity of expecting to get a cheap gas on these lines. The obtaining of hydrogen by the decomposition of water effected by the electric current, has also been proposed; but it would not be possible to produce hydrogen at anything like a marketable figure, according to any of the present known methods of producing electricity.

When large quantities of greasy or oily refuse accumulate as a waste product from manufacturing operations, it is possible to turn them to account as gas producing materials. For example, Mr. Gore has given an interesting description of the utilization of olive-oil refuse.* It is first air-dried by exposure and repeated turning with the shovel; and requires to be carbonized in very thin layers, at not less than an orange heat. Mr. Gore obtained the best results from a charge of 96 lbs., in a very flat oval retort of iron, 9 feet long by 20 inches wide. The thickness of the layer of material was about 2½ inches. The gas was largely charged with watery vapour, tar, sulphur, and carbonic acid—the latter being put at 22 per cent. A condensing area three times as great as that used in coal gas works was therefore recommended, and also large washing and purifying surface. Another practical disadvantage was the obstinate retention by the oil gas of a small quantity of acid impurity, which acted injuriously on the leather in governors and meters. The quality of the gas was 20 to 22 candles; and it could be used with facility as an enricher for ordinary coal gas. Even assuming that the material could be obtained *gratis*, it is evident that the cost of condensation and purification would be such as to render it impossible to work the process commercially unless a very high price could be obtained for the product.

One or two ideas that are more remarkable for eccentricity than for business common sense, may be briefly noticed. In 1849, MM. Livenais, of Bordeaux, showed that grape skins, lees, and residue from wine manufacture, was a valuable gas-producing agent. He said that 1 lb. of the dried residue, charged into a hot retort, yielded in a few minutes about 6 cubic feet of illuminating gas, which furnished a bright white light. In 1866, a new gas was advertised and exhibited in London, as costing less than nothing. Very great superiorities were claimed for it, as compared with coal and other kinds of gas, and the illuminating value was put at about 50 candles. Enquiry elicited the fact that the material used for the production of this gas was ordinary cocoa-nut shells. It is strange that so many inventors overlook the fact that the cost of collecting waste materials such as nutshells, must necessarily be such as to make the price of the material, supplied by the ton, certainly not less than coal. Another inventor has remarked that ordinary cockchafers, collected in quantity, and submitted to destructive distillation, yield good illuminating gas, and a residue that may be utilized as carriage grease.

We learn that Mr. A. C. Fraser, formerly Engineer and Manager of the Gas Department of the Bolton Corporation, has commenced business as Consulting Engineer at Halifax.

An autobiography of Richard Tangye, F.R.G.S., of Tangyes Limited, describing the rise and development of the vast industry centred in the Cornwall Works, Birmingham, is shortly to be issued by a London publishing house. The book will be illustrated by original drawings by Frank Hewett.

At the meeting of the Council of the Royal Society last Thursday, at which the formal announcement was made of the death of Dr. Joule, it was resolved, on the motion of Sir H. Roscoe, to appoint a Committee to take steps for the erection of a national memorial in recognition of his great services to science.

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* See Journal, Vol. XVI., p. 132. † *Ibid.*, Vol. XXV., p. 594.
‡ *Ibid.*, Vol. XXVII., p. 46.

* See Journal, Vol. XXVI., p. 11.

Technical Record.

THE SUPPLY OF COMPRESSED AIR IN PARIS.

The publication, in the last number of the JOURNAL, of the account of the visit of the Midland Association of Gas Managers to the works of the Compressed Air Company in Birmingham, will have again directed our readers' attention to this system of supplying power. As they may possibly be interested in learning what is being done in this respect in Paris, by the Popp Company, we reproduce, from the paper on the subject read by Mr. A. B. W. Kennedy, F.R.S., before the Mechanical Science Section of the British Association, at their recent meeting, the following particulars in regard to that Company's plant and operations.

The author commenced by alluding to the great importance, in an industrial country, of the subject of the transmission of power to a distance; remarking that where the distance is to be measured by miles, only four agents—steam, water, air, and electricity—seem to be practically available. All of these had, he said, been used to a greater or less extent, and with varying success. Passing on to refer to the agent to be specially dealt with, he mentioned the establishment of the Birmingham works on a very large scale, and then proceeded with his account of the Paris works, as follows:—The work now carried on by the Paris Compressed Air Company has developed from very small beginnings—at first slowly, lately very fast. It originated in a pneumatic clock system which was started about 1870 with a small central station in the Rue St. Anne, in the centre of Paris. This business grew gradually until it became far too large to be carried on from such a position; and a few years since a central station, with much enlarged machinery, was established in the Rue St. Fargeau, which is in Belleville, about 4½ miles east of the Madeleine. There are at present about 8000 pneumatic clocks, public and private, in Paris, driven from St. Fargeau, and regulated by a standard clock in the Rue St. Anne; but as this part of the work, although it originally formed the basis of the whole system, is now a comparatively very small part of it, and is of an entirely special nature, I do not propose to say anything further about it here. Until two years since, a pair of single-cylinder horizontal engines and a beam-engine sufficed for the whole work; but by that time the demand for compressed air for working motors had so increased, that extension had become imperative, and the present working plant of six compound condensing engines, each working two air compressors, with the necessary complement of boilers, was put down. This plant, except the compressors, was supplied from England. The compressors for the English engines were made in Switzerland on the Blanchod system. The demand for power is at present so great that at certain hours of the day practically the whole plant, old and new, indicating considerably over 2000-horse power, is fully at work; and, in consequence, a duplicate main is being laid throughout, and new engines and compressors are being pushed forward as rapidly as possible.

After describing the general arrangements of the Paris Company's works, the author of the paper proceeded: I come now to the experiments I made to ascertain its efficiency. Starting from the main engines at the central station, the particular matter I had to determine was the indicated horse power which would be shown by a small motor three or four miles from St. Fargeau for each indicated horse power expended by the main engines on the air which passed through that motor. The ratio thus obtained would be the total indicated efficiency of the whole system of transmission. This ratio is in reality the product of a number of separate efficiencies; and the separate determination of these formed a necessary check on the value of the total efficiency. These separate efficiencies may be summarized as follows:—(1) Mechanical efficiency of main engines, or ratio of work done in the compressors to the indicated work in the steam cylinders; (2) efficiency of compressors, or ratio of maximum work which could be done in a motor by each cubic foot of compressed air at 70° Fahr. to the work actually done in compressing that air; (3) efficiency of mains, or ratio in which the capacity of the compressed air for doing work is reduced by friction and leakage; (4) efficiency of reducing valves, or ratio in which the capacity of the compressed air for doing work is reduced by the lowering of its initial pressure at the motor; (5) indicated efficiency of motor, or ratio in which the actual indicated work done falls short of the maximum work which the quantity of air measured through the meter could do after passing the reducing-valve. The product of these five efficiencies is the total efficiency of transmission without the use of a heater. When a heater is used, the matter is somewhat more complicated. Summarizing the whole matter as regards efficiency, it may be said that the result of my detailed investigations is to show that the compressed air transmission system in Paris is now being carried on on a large commercial scale in such a fashion that a small motor, four miles away from the central station, can indicate, in round numbers, 10-horse power for 20 indicated horse power at the station itself, allowing for the value of the coke used in heating the air, or for 25 indicated horse power if the air be not heated at all. Larger motors than the one I tested (and there are a number of such in Paris), may work somewhat more, and smaller motors somewhat less, economically. The small rotary motors would, of course, be much less economical. The figures I have given are, however, such as can be reached by any motor of between 5 and 25 indicated horse power, if worked at a fair power for its size.

A system of transmission which has actually been carried out on a large commercial scale, in such a way as to have an indicated efficiency of 50 per cent. between prime mover and secondary motor four or five miles apart, is one which needs no adventitious aids to commend it to notice, especially where its uses are so numerous and so varied, and its convenience so extremely great, as are those of compressed air. While, however, I am unwilling to lay stress on possibilities which are not yet actualities, there can be no harm in saying I have no doubt whatever that with mere improvement of the existing methods and appliances, and without the adoption of any new or untried methods whatever, the new plant of the Paris Company, now being constructed, can be made to have an indicated efficiency of 67 instead of 50 per cent., and to give about 0·54 effective horse power at the motor for each indicated horse power at the central station, in the case of such a motor as that on which I experimented. Under these circumstances, the air used per indicated horse power at the motor would be 520 cubic feet, or 650 cubic feet per brake horse power. I have the less hesitation in giving these hypothetical figures because the more important imperfections of M. Popp's transmission system arise from so very obvious a cause. The success of the system has been essentially due rather to the practical good sense with which the work has been carried through than to any special novelty in the methods employed. The air compressing arrangements at St. Fargeau are in no respects novel or specially perfect; they had been used over and over again before. There is no special advantage in M. Popp's rotary motor, that may not probably be possessed by many other rotary motors. The larger motors are simply good ordinary steam-engines, such as can be bought any day in the open market, used without the slightest alteration. Of the fan motor, it can only be said that it works well enough to allow progress to be made while it is being improved, and even of the coke-stove one would not like to say very much more. The plan of heating compressed air before using it in a motor, was first proposed many years ago. The great success which has attended the work in Paris has been attained because its directors have wisely chosen rather to set to work with imperfect apparatus if only it were simple, fairly effective, and ready to hand, than to wait for the possible invention of novelties and improvements, or to risk the success of their start by the use of any unknown or untried apparatus, however promising its nature. They have had, moreover, the great advantage hitherto of being always asked for more air than they could supply; so that their works have grown and increased simply to meet a growing and increasing demand, and (fortunately, perhaps) the urgency of the demand leaves them no alternative but to meet it by the simplest possible means.

I have already mentioned the great convenience and handiness which a compressed air motor possesses. From the engineer's point of view these qualities are most striking. The engine starts, for instance, without the least hesitation, even with full-brake load on, directly the valve is opened, if the crank is just past the centre. This, of course, is impossible with a gas-engine, and hardly less impossible with any ordinary (single-cylinder) steam-engine. Then there is the absence of the heat and leakage, and of the noise and smell, which so often accompany the smaller steam or gas motors. But from the consumer's point of view the advantages are even greater than from the engineer's. There is, first of all, the complete absence of danger and of nuisance of every kind. There is then the great saving of space, even as compared with the gas-engine, and much more as compared with the steam-engine and boiler. There is reduction of insurance on account of the entire absence of fire risk. Not only this, but the air motor seems to me completely to supply that most important industrial want—a motor suitable for "small industries;" that is, for work carried on in workmen's own houses or in very small workshops, for here it is not only mechanically most suitable, but in the nature of things it can be made to cool or ventilate by its exhaust to any desired extent. The sanitary advantage of this, in cases where work is carried on in confined spaces, can hardly be exaggerated. The larger proportion of the compressed air in Paris is used for driving motors; but the work done by these is of the most varied kind. A list which I have gives the locality, use, and power of 225 installations, nearly all motors working at from ⅛-horse to 50-horse power, all driven from St. Fargeau, and the great majority of them more than two miles away from it. In a number of cases the motor drives dynamo machines for electric lighting. In the offices of the *Figaro* and the *Petit Journal*, large motors are also used for printing; and there are many small printing establishments in which machinery is also worked by compressed air. Among the smaller industrial purposes for which the air motors are used in Paris, I find the driving of lathes for metal and wood, of circular saws, shearing-machines, drills, polishing-machines, and many others. They are used also in the workshops of carpenters, joiners, and cabinet makers, smiths, umbrella makers, collar makers, bookbinders, and naturally in a great many places where sewing-machines are used, both by dressmakers, tailors, and shoemakers, and from the smallest to the largest scale. They find application also in all sorts of industrial work, with confectioners, coffee roasters, colour grinders, billiard-ball makers, and in many departments of textile industry.

As to the rate at which the compressed air is sold, I believe that in most of the larger installations the work is done by contract (at so much per lamp-hour in the case of the electric lighting); but in the smaller ones the air is charged for by meter. The rate of charge is 1·5c. per cubic metre for air used in motors, and 2c. per cubic metre for air used directly. Air used for raising fluids is

charged according to quantity raised. The former rate is equivalent to 4·25d. per 1000 cubic feet (the volume in all cases being measured at atmospheric pressure). In addition to this a fixed charge of from 100 frs. to 250 frs. is made for pipes and connections, and a small rent for the motor if it is not bought outright or by twenty-four monthly instalments.

THE PROTECTION OF SERVICE-PIPES.

The accompanying illustration shows an arrangement introduced by M. Avril, of Bordeaux, for the protection of service-pipes from the action of the surrounding soil. It has been for some time in use in that city, with satisfactory results; and M. Avril brought it before the members of the Société Technique du Gaz en France at their last congress. The method of carrying out the plan is so clearly indicated in the engraving that description is

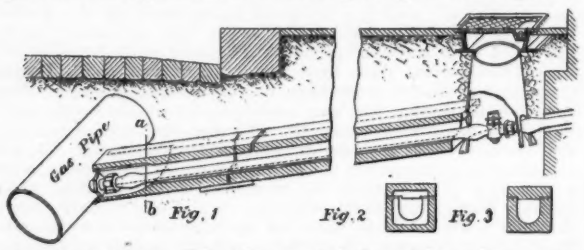


Fig. 1 Fig. 2 Fig. 3

scarcely necessary. Fig. 1 is a general view of the entire arrangement; fig. 2, a section of the protecting box at *a b*; and fig. 3, a section of the higher part of the box. In fig. 1 the position of the lead service-pipe, with its connection to the main, is shown. The tap is protected by a cast-iron cover, above which is the plate in the pavement whereby access is gained to the pipe. This plate is pierced with several holes, to allow of the escape of any gas that may leak from the joints. The wood of which the box is composed is the sea-pine of Les Landes, in the south of France, which is sold in logs about 6 feet long and of variable girth, according to the use to which it is to be put. The log is first of all squared up, the upper portion taken off so as to form a lid, and the other piece grooved to contain the pipe. These operations are performed mechanically with considerable rapidity. The box thus formed is then steeped in creosote or sulphate of copper, and is ready for use. These protecting boxes are used in Bordeaux both for the private services and those leading to the public lamps; and M. Avril claims for them certain points of superiority over other systems. In the first place, they possess great solidity. By the block of wood being in one piece, stability is ensured, and the chances of the pipe becoming bent are entirely removed; while the pipe is so well enclosed that not only is complete protection afforded against exterior deteriorating agents, but condensation of water or formation of naphthaline is less to be feared. The box is easily placed in position; and when renewals of services are necessary, they can be readily effected by merely opening trenches at the two extremities, and drawing out the pipe. A further advantage claimed for these boxes is that they assist in indicating leakage; the escaping gas collecting in the box, and being thereby conveyed to the surface of the soil and thence through the perforated plate to the atmosphere. The cost of the installation of this system is slightly higher than that of other arrangements in use; but M. Avril considers that this is compensated for by the advantages above enumerated.

"Jobbery in Electric Lighting."—In the course of a letter, under the above heading, recently addressed to *The Times*, Professor Silvanus P. Thompson said: "This morning (the 18th) I received an inquiry from a gentleman of my acquaintance, whom I am not at liberty to name, informing me that a certain provincial town, which I would not mention for worlds, was about to provide itself with electric lighting, and suggesting to me that if I were to apply to become Consulting Electrical Engineer to the Municipality in question, I should in all probability, if not certainty, be selected for that post. But my correspondent, who undoubtedly is in command of great local influence, was good enough to couple this suggestion with the information, for my private ear, that it was to be an understood thing that, in laying down the future lighting station, the boilers of the firm of Messrs. ——— were to be employed. I need not detail my reply to a proposition of such a nature, which I had more than one reason for declining."

"The Amateur's Workshop."—A handy little volume of 240 pages, bearing this title, has just been issued by Messrs. Swan Sonnenschein and Co. The author is best known as Editor of the last edition of "Lockwood's Dictionary of Mechanical Engineering Terms;" and the book under notice mainly consists of reprints of articles of his written for the *English Mechanic*. The subject-matter has, however, been re-arranged and revised; fresh material has been added; and descriptions of several new machines and appliances are introduced. The aim of the author has been to supply, in a simple and concise manner, information respecting the principles of construction and modes of operation of engineers' machines and tools, and hints as to the judicious selection of the same. In several cases, too, sufficient details and dimensions are given to enable skilful amateurs to construct the things for themselves; but no attempt has been made to explain or illustrate the processes and operations performed with these machines and tools.

THE ESTIMATION OF FERROCYANOGEN IN SPENT GAS-PURIFYING MATERIAL.

In November last year a meeting of chemists connected with gas undertakings was held at Karlsruhe, for the discussion of the methods of analysis employed in gas-works; and special stress was laid on the difficulties encountered in making determinations of the amount of ferrocyanogen in spent purifying material. Whereupon Dr. O. Knublauch, Chemist to the Municipal Gas and Water Works in Cologne, expressed his willingness to publish the information on this subject which has accumulated during many years. He has lately carried out his promise; and we now set before our readers the information he has furnished to his colleagues, as given in a recent issue of the *Journal für Gasbeleuchtung*.

Ferrocyanogen may be easily determined in pure ferrocyanogen compounds; and it is only when exact determinations on impure products are required, that difficulties crop up. Spent gas-purifying material contains ferrocyanogen in an insoluble form; and, in addition, a great number of other compounds, some of which are soluble in water, whilst others dissolve in the alkalies or alkaline earths which are used for the extraction of the ferrocyanogen. As examples of such compounds, thiocyanates, sulphur compounds, free sulphur, ammonium salts, and particles of tar, carried over mechanically, are always present in these matters. Now, when the estimation of ferrocyanogen is made by titration with copper solution (as, for example, in Bohlig's method), the impurities act deleteriously, either by reacting with the copper solution, or by interfering with the distinctness of the final stages of the titration; whilst titration with permanganate is quite useless for the purpose, for, even after getting rid of the thiocyanates, there remain large quantities of other substances oxidizable by permanganate. If it is desired to estimate the iron present as ferrocyanogen in the extract, with the object of ascertaining the quantity of ferrocyanogen, there is the objection that it is difficult, if not impossible with our present knowledge of the composition of ferrocyanogen compounds, to state definitely that the iron estimated really exists in the form expressed by the usual formula. It is first necessary to eliminate all iron not present as ferrocyanogen—an operation which is somewhat uncertain in the presence of such various organic compounds. In fact, the assumption that the complete precipitation of the iron is prevented by the presence of such compounds is justifiable, until there is proof to the contrary. Moreover, compounds resembling ferrocyanogen in their behaviour with alkalies and alkaline earths, are also produced in gas-purifying material; but they are of little or no value to the consumer. When these compounds are present, the end reaction is not sharp. The precipitates produced by ferrous salts are greenish, whilst after titration with copper solution the liquid is greenish yellow. As, however, these compounds are present in relatively small quantities, it must not be asserted off-hand that a process is useless because it is based on the estimation of iron, although it would be difficult to prove experimentally that the above considerations are unfounded. The molecular weight of potassium ferrocyanide, as compared with that of iron, is as 422·8 : 56; therefore the amount of iron found by analysis has to be multiplied by 422·8 ÷ 56, or 7·55, in order to transform the numbers obtained into proportions of potassium ferrocyanide. It will thus be seen that the error produced even by a small quantity of iron not present as ferrocyanide may become considerable.

In the course of the author's experiments on the formation and estimation of ferrocyanides, it has happened that iron hydroxide has separated from the solutions. In this way, therefore, iron previously present as ferrocyanide may become removed from solution, and escape being estimated. In both these circumstances, the numbers obtained for iron would not lead to correct results. The numbers would come nearer the truth with material that did not contain any ammonia before purification; with that which had been utilized as much as possible, and contained but little thiocyanates or ammonia; and with that which had been well revivified subsequent to its being used in the works. In many other cases, however, errors are inevitable.

Another way of estimating the ferrocyanide is to ascertain the amount of cyanogen or nitrogen, and to calculate the ferrocyanogen from the results. But here also difficulties are met with—in thiocyanates, for instance—which would affect the calculations much as when the quantity of iron is taken as the basis. No absolutely accurate method is known for the determination of the value of the commercial product; it is therefore best to select one which will throw some light on the technical value of the material, and which is founded on the same operations as are applied in preparing the valuable products from it. On this basis the following scheme appears to be the safest:—Conversion of the insoluble into soluble salts, purification of the extract, and estimation of ferrocyanide direct with copper solution—a plan found to work satisfactorily by the author.

Before proceeding to give the details of the process, the author describes experiments to show how far the various operations involved are admissible, and also what degree of accuracy may be expected from the method. The points investigated are: (1) The temperature to which the mass may be exposed for drying, without suffering decomposition. (2) The manner of converting the ferrocyanogen from the insoluble to the soluble form, at the same time avoiding, as far as possible, the introduction of objectionable compounds into the solution. (3) The removal of these objectionable compounds from solution. (4) The method of

rendering most distinct the termination of the titration with copper solution.

With regard to the preparation and drying, the importance of careful sampling is first set forth, especially in heaps of varied composition, containing not only lumps of iron hydroxide, which are most likely unacted upon in the interior, but also pieces of other materials. The sample must be crushed and subdivided as rapidly as possible, and dried. The author finds that temperatures between 50° and 60° C. for five to six hours are safe; but at 100° to 110° C., slight decomposition ensues. It is thought best to expose the mass to the former temperature (50° to 60° C.) until a constant weight is obtained, then to pulverize, and pass through a sieve of 360 meshes to the square centimetre.

The next point is the conversion of the insoluble ferrocyanides into a soluble form. Boiling with alkali or lime dissolves sulphur, and introduces into the solution many other interfering substances. Experiments were therefore made with cold solutions; and it was found that, to ensure complete decomposition of the insoluble ferrocyanides, the alkali must be sufficiently strong, in large excess, and in contact with the mass for some time. Ultimately the strength is fixed at a 10 per cent. solution of potassium hydroxide, to be used in proportions of 50 c.c. to each 10 grammes of material, which are to be left in contact for 15 hours with frequent agitation, or, if only approximate results are required, three hours' contact will be sufficient. The results of other experiments show that the purification of the extract may be efficiently effected by treatment with an acid solution of ferric chloride. If sulphuretted hydrogen is also present, it may be removed by means of lead carbonate. The latter, however, should not be resorted to unless the sulphuretted hydrogen reaction is very pronounced; and after the use of lead, the filter titration must be used for calculations, as the lead appears to interfere with the spot test. Small quantities of sulphuretted hydrogen only exert an unimportant influence on the result; and therefore it would be well if the seller and purchaser agreed under such circumstances that treatment with lead was not to be introduced. The completion of the titration is ascertained by testing some of the solution with ferric chloride, which gives a blue coloration as long as any potassium or other soluble ferrocyanide remains in solution. So long as the quantity of ferrocyanide in solution is moderately large, the blue coloration is instantly produced, and is very pronounced; but as the quantity diminishes, so does the rapidity of the formation and the distinctness of the blue coloration also fell off. The method of testing usually employed is placing a drop of solution on filter-paper, and a drop of ferric chloride a short distance from it on the same paper; then to note, as the drops of liquid spread, whether or not a blue coloration forms at the point of contact. If, however, when the titration is found to be approaching completion by this method, a small quantity of the solution is carefully filtered off, through a small but perfect filter, and the absolutely clear filtrate, contained in a test-tube, treated with ferric chloride, then, owing to the depth of liquid, a very much weaker blue coloration can be seen than is possible with the spot method; and therefore the filter titration invariably comes out higher than the spot test. The same time must always be allowed, after the addition of the ferric chloride, for the appearance of the blue coloration—about two minutes for the spot test, and from a quarter to half a minute for the filter-test. The same precaution must be taken after adding the copper; and all calculations must be based either on the spot or the filter titration, or the mean of the two. When sufficient copper solution has been added, the blue coloration gives way to a brownish tint, which can be clearly observed after filtration, especially if a very small quantity of a dilute solution of a thiocyanate is added.

After completing these investigations, the author adopted the following method of analysis:—The entire sample of 200 to 250 grammes is dried at from 50° to 60° C. for five to six hours, weighed for moisture, then pulverized, and passed through the sieve. If any sawdust is present, this remains on the sieve, and is weighed separately. Next 10 grammes of the sifted material are treated with 50 c.c. of a 10 per cent. solution of potassium hydroxide (potash) in a flask marked at 250 c.c. and 255 c.c., either for 15 hours with frequent agitation, or for 16 hours and shaking frequently during the first and last two hours. The flask is then filled to the 255 c.c. mark, and the contents filtered. Next, 100 c.c. of the filtrate are run into a hot solution of ferric chloride, containing 60 grammes of ferric chloride and 200 c.c. of hydrochloric acid (having a specific gravity of 1·19) per litre, and filtered hot (about 80° C.) through a folded filter (12 centimetres diameter), and best covered over in a hot-water funnel. The precipitate is washed with hot water, but not for too long a time. The filter is now spread out in a porcelain dish, and the precipitate decomposed with 20 c.c. of 10 per cent. potash; care being taken that none of the Prussian blue escapes decomposition. The liquid is washed into a 250 c.c. flask and tested with sodium nitroprusside for sulphuretted hydrogen. Failing an immediate and distinct reaction, 50 or 100 c.c. of the filtered liquid are titrated direct, adding 2·5 c.c. or 5 c.c. of sulphuric acid (strength, 1 of acid to 5 of water). If sulphuretted hydrogen is present, the unfiltered liquid is treated with 1 or 2 grammes of lead carbonate, filtered quite clear, and titrated. The copper sulphate solution contains from 12 to 13 grammes of the salt per litre; and it is standardized by titration with a solution of pure potassium ferrocyanide containing 4 grammes per litre. The same quantity of acid must always be added for titration, and the precautions noted above in regard to time must be observed. When precipitation as Prussian blue only has been used for purifying the extract, calculations may be based on either the spot test or the filter titration; but when lead treatment has also been resorted to, only the filter titration may be used for calculating the percentage of ferrocyanide present, which is ascertained by using the following formula, where a = the number of cubic centimetres of copper solution required for the titration of 50 c.c. of the solution containing $10 \times \frac{2}{3} \times \frac{1}{5} = 0{\cdot}80$ gramme of the substance under examination; and b = the number of cubic centimetres of copper solution required for titrating 50 c.c. of the standard potassium ferrocyanide solution containing 0·20 gramme of the salt. Then—

$$\frac{a}{b \times 0{\cdot}04} = \text{percentage of potassium ferrocyanide in the substance dried at 50° to 60°.}$$

The numbers obtained for potassium ferrocyanide may be converted into the corresponding numbers for the several cyanogen compounds by the use of various factors. If p = percentage of potassium ferrocyanide, then—

$p \times 0{\cdot}511$ =	percentage of	hydro-ferrocyanic acid.
$p \times 0{\cdot}678$ =	"	Prussian blue.
$p \times 0{\cdot}369$ =	"	cyanogen.
$p \times 0{\cdot}383$ =	"	hydrocyanic acid.

As a rule the spot and filter titrations only differ to the extent of from 0·2 to 0·6 c.c. when from 8 to 12 c.c. of the copper solution of the above strength is used; and the addition of the last 0·2 c.c. of copper solution generally results in blue coloration, changing to brownish, or even to colourlessness. There are occasions, however, when the filtrates from the copper precipitates give persistently green or greenish-yellow colorations with iron. Another exception is sometimes encountered. Most filter papers contain sufficient iron to give the blue reaction without adding more iron; and, with pure ferrocyanides and most samples of spent material, the results registered by spot-tests made with or without added iron agree. But, on the other hand, in some instances the result recorded with iron is higher than that shown without iron; whilst the test obtained with the filter titration comes out very much higher still. This anomalous behaviour the author considered to be due to the presence of substances which become converted into ferrocyanides, but which are not present as such, and should not be regarded as of equal chemical value. It is for this reason that, in the author's opinion, the percentages of iron or cyanogen are unsuitable data on which to base calculations for ascertaining the percentage of ferrocyanogen in spent material containing these particular compounds.

Many experiments were instituted to investigate the character of these substances. Firstly, it was found that the two spot tests could be made to agree by precipitating the ferrocyanides twice as Prussian blue; but still the spot differed from the filter titration. To ascertain the character of this substance which caused the difference, varying quantities of copper solution were added to the extract of the spent material; and, after filtration, the filtrate was poured in hot ferric chloride solution in the usual way, the precipitate so obtained being titrated, and the solution from it filtered and subjected to a similar course of treatment. Various periods, too, were allowed to elapse between the experiments. More washing was tried; and more agitation, and sundry other alterations in the conditions of experiment, were essayed. The result was that the solutions were found to contain substances which either impeded the precipitation with copper sulphate or which yielded ferrocyanides in small quantities by being decomposed. It was therefore suggested that whenever the anomalous behaviour is observed, the material should be treated in the following manner, in order to ascertain its true value:—Add somewhat more copper sulphate than that indicated as necessary by a preliminary spot test; for if too little copper solution is added, even pure ferrocyanide gives anomalous results. Then precipitate the filtrate from this copper precipitate with ferric chloride; decompose and titrate. In order to get sufficient of this second precipitate, more of the original solution may be employed. A further treatment of the solution from the titration of the second precipitate may be carried out, if it is thought desirable. In this way numbers will be arrived at which may be added as corrections to those obtained in the usual manner; and it will be found that the spot and filter titrations become more in accordance with one another—the former increasing while the latter decreases. When material has stood for some time, it ceases to behave in this anomalous manner; and apparently the disturbing substances disappear. This accounts for their general absence in material which has been stored for a lengthened period, or which has been revivified. The disturbing substances appear to contain varying quantities of iron and cyanogen, and also a small amount of sulphur. In their presence the spot test gives results too low; and the filter titration yields results above the truth. The only alternative for the fractional titration just described is an agreement between the vendor and purchaser as to what estimation is to be taken as representing the value—perhaps, for instance, a mean of spot test without iron and a filter titration. The anomalous materials are not frequently met with in Cologne; and therefore the ordinary method described by the author generally answers. It must be remembered that the value of the stuff depends not only on its power of absorbing sulphuretted hydrogen, but also on the amount of ferrocyanogen contained in the spent material, and the larger the proportion of the ferrocyanogen to the sulphur, the greater is its value.

The paper concludes with tables showing the results of analyses of purifying material from the Cologne Gas-Works.

THE POSITION OF OUR COAL RESOURCES.

At the recent Meeting of the British Association, Professor Hull read a paper on the above subject. It may be remembered that the author is the Director of the Geological Survey in Ireland; and therefore his communication was received with considerable interest. In connection therewith he had prepared a diagram showing the rate of production of coal from the beginning of the present century. In the year 1800, the output probably did not exceed 10 million tons, a very large proportion of which was drawn from the Newcastle district. In the year 1830 the quantity raised in the British Islands was about 29 million tons; in 1860 it had reached 80 millions; and in 1888 the quantity was 170 million tons, as shown by the Board of Trade returns. There was reason for believing that, between the beginning of the century and the year 1875, the output of coal had more than doubled itself for each successive quarter of a century. Since the year 1860, in which the author had estimated that sufficient coal existed, going to a limited depth of 4000 feet, to last, at the rate of production for that year, for 1000 years, the available quantity of coal had been reduced by 3650 million tons; but this amount, great as it was, had not very materially affected our coal resources. The production of the South Wales coalfield had doubled in the quarter of a century between 1854 and 1879, and in 1888 amounted to the enormous total of 27,355,000 tons, largely owing to the demand for steam coal in the Cardiff district. The resources of this great basin are enormous, and render it capable of maintaining or increasing its present output for a long period of years. The Lancashire and Cheshire and the great Yorkshire and Nottingham coalfields are highly progressive, as is also the Northumberland and Durham. This great northern coalfield, notwithstanding the long period over which it has been worked, shows no signs of falling off in its output. The discovery of the liassic ironstone of the Cleveland district and the great exports from the northern ports, have given a vast impetus to northern coal mining during the last quarter of a century; and the enormous drain upon this coalfield, the limits of which have been definitely determined, cannot fail to cause a serious falling off in its output during the twentieth century, although there is sufficient to maintain the present rate of consumption for 300 years. The relation between coal production and the development of the iron trade since the discovery of the ironstone deposits of the North Riding of Yorkshire, and the richer hematites of North Lancashire and Cumberland, was then considered; and the different coalfields of the British Isles were passed in review, in order to show those which are in a progressive condition, and those which are stationary or retrogressive. The author concluded by expressing an opinion that, while the enormous output of coal during the past few years had not actually crippled our resources, a general rise in the value of coal must ensue in the near future, owing to the greater depth at which the mines will have to be worked, and the increased cost of coal mining. Reference was then made to the great expansion of coal mining in America; and the author agreed with the late Professor Jevons that future British manufacturers must not expect to derive any help from the import of coal from the United States, when coal shall have become dear or scarce at home.

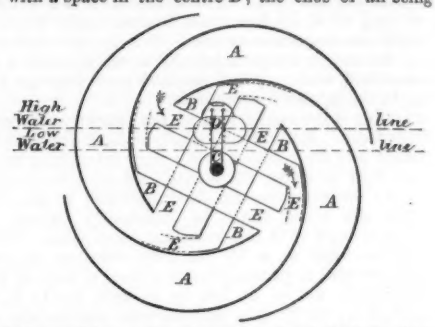
In the discussion following the paper, Mr. Stephen Bourne confessed that he did not share the author's views concerning our position if our supplies of coal failed in any way; nor did he advocate the restriction of its use, if that use were a practical one. It seemed to him that the process of discovery was opening out supplies in different parts of the world. He might instance Canada in this respect. This coal supply would not be of much use to us here; but at any rate it would be the means of economizing our own supply. Then there had been the discovery of immense fields of petroleum. Although there was some difficulty in adapting petroleum to some of the uses of coal, there could be no dispute that this supply had lessened the strain on coal for gas making purposes, and there was every reason to believe that before long it would be adapted to other uses. Mr. G. W. Hastings, M.P., discussed the subject from the point of view of a political economist; and remarked that foreign competition had not affected the price of coal. Mr. Marley, President of the Northern Institute of Mining and Mechanical Engineers, directed Professor Hull's attention to the fact that 30 years ago the coal used in the manufacture of a ton of pig iron was double the quantity now needed. Steel also required only about half the number of tons of coal for each ton manufactured. This was an element to be taken into consideration in future. Professor Hull, replying on the discussion, said petroleum was not likely to cause much difference in the demand for coal in this country. He concurred with Mr. Hastings that foreign competition had nothing to do with the question of the price of coal. He looked upon low prices as due to over-production. More pits than were necessary were sunk after the last period of revival. As to Mr. Marley's remarks on the greater economy of fuel in the manufacture of iron, he himself could remember when 8 tons of coal were required in the Midlands for the production of 1 ton of iron, whilst now only 1¼ tons of coke were used in Cleveland per ton of pig iron. At the same time, the economy in the use of coal was more than counterbalanced by the enormous increase in the production of iron.

An interim dividend at the rate of 5 per cent. per annum has just been declared by the South African Lighting Association, Limited.

Register of Patents.

Wet Gas-Meters.—Mills, G., of Herne Hill, London. No. 15,471; Oct. 27, 1888. [6d.]

These improvements consist in the measuring wheel or drum of a wet gas-meter being divided into cycloidal or crescent-shaped compartments A, with a space in the centre B; the ends of all being covered,



and the whole revolving on its axis, or on a fixed shaft C, which may be made hollow, with a branch pointing upwards and forming an inverted tee. The top of this hollow branch is a seating for a valve; and a float or cylinder is allowed to slide up and down the perpendicular part of the branch D. To this float is attached a cone or cover to fit the valve-seating. On the top of the branch, the float is made to rise or fall according to the height of the water in the meter; and thus admit or shut off the gas in the centre of drum.

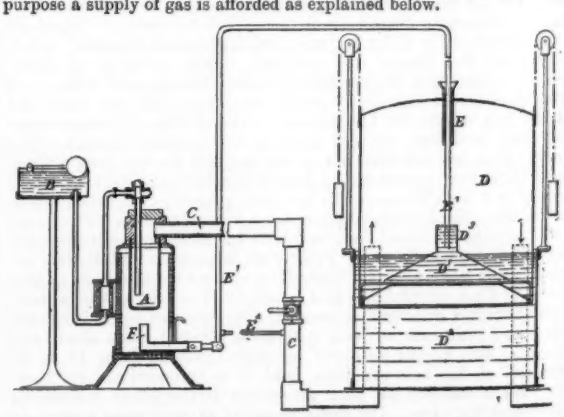
If a solid shaft is used, gas enters the centre of the drum in the usual manner—viz., through a bent pipe or tube; but if the hollow shaft is used, then the gas passes through it into the central space B, and from thence into the open end of the cycloidal or crescent-shaped compartment A above the water line, and discharges itself (after measurement) through the opening in the outer circle.

To compensate for the variation in the measurement of the gas through the lowering of the water-line in the meter, a tube E into each chamber of the drum is arranged across the central space, so that when these tubes are in a horizontal position the tops are level with the highest water-line in the meter. The other end of each tube is bent and inserted into the entrance of the opposite or filling chamber. It is so arranged that as the water-line in the meter is lowered, each tube E will take a proportionate quantity of the gas that has already passed the measuring chamber, and return it into the opposite chamber that is then filling. In this way it will compensate for the loss of registration occasioned by the lowering of the water-line in the meter.

Generation of Gas from Oil.—Brotherhood, C., of Redland, Bristol. No. 16,118; Nov. 7, 1888. [8d.]

This invention relates to improvements in the apparatus for generating gas from oil or other liquid fuel patented last year, No. 1315.

The invention consists, firstly, in improvements in apparatus for controlling in an automatic manner the generation of the gas, and thus regulating the supply in accordance with the demand. For this purpose the gas is conducted from the retort to a holder of the ordinary kind. At the bottom, the upper or moveable part of the holder carries a chamber which, when the upper part is sufficiently depressed, is submerged in the water contained in the tank or lower part. This chamber, being open at the top, becomes filled with water on submersion. Extending into the holder is a pipe which communicates with the burner whereby the retort in which the gas is generated is heated when that method of heating is adopted. As, in the generation of the gas, the pressure in the holder increases, the upper part is raised accordingly; and when, as the water chamber rises, the mouth of the pipe which feeds the burner is received in the chamber to a sufficient depth, the supply of gas to the burner is arrested by the water forming a seal. Continuing to rise, the chamber emerges from the water in the lower part of the holder and causes an increase of pressure in the upper part and in the retort; and thus a balance is produced between the pressure in the holder and the column of oil or other liquid being fed to the retort. The generation of gas is thus arrested until, under the influence of the demand made upon its contents, the upper part of the holder descends. The burner below the retort is always maintained alight, for which purpose a supply of gas is afforded as explained below.



The illustration represents, principally in vertical section, apparatus constructed and arranged according to one method of carrying the

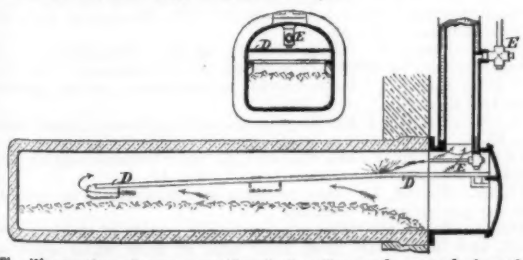
invention into effect. A is a retort for generating the gas; fuel being fed to it from a tank B, as described in the former patent. From the retort, the gas is conducted by the pipe C to a holder, the upper or moveable part D of which is provided at its base with a chamber D^1, preferably conical, as shown. This chamber is open at the top; and when submerged, it becomes filled with water from the tank D^2 of the holder. As gas accumulates in the holder, the upper part of it is raised; the water chamber being so placed that it commences to emerge from the water in the tank before the holder becomes filled with gas. The increased energy necessary to further raise the moveable part of the holder, as it continues to emerge from the tank, causes the pressure in the holder to be raised; and this pressure acts, through the pipe C and retort A, upon the column of fuel feeding the retort, and retards the supply. When the pressure in the holder is lessened by the withdrawal of gas, or from other cause, the converse of the foregoing occurs; and so the generation of gas is controlled in an automatic manner, and directly varied in accordance with the demand.

If it be desired to heat the retort by gas from the holder, the following means of regulating automatically the flow of gas to the burner are adopted:—Extending through a stuffing-box E into the upper part of the holder is a pipe E^1 communicating with the burner F; and surmounting the chamber D^1 is a cylindrical mouthpiece or neck D^2. When the upper part of the holder rises, the lower end of the pipe E^1 is received in the water contained in the neck, and further supply of gas to the burner is thereby prevented. The pipe E^1 is so adjusted that the sealing of it by the water occurs when desired; it being understood that the adjustment must be such that the length of pipe immersed always corresponds to a greater pressure than that existing in the holder and resulting from the rise of the chamber D^1. A flame is constantly maintained at the burner F, by gas supplied through the pipe E^2 communicating with the pipes C and E^1. This flame is, by the operation of the chamber D^1 upon the pipe E^1, augmented as the holder D descends, and diminished (but not below the normal dimensions) when it subsequently rises.

Various minor modifications of the foregoing arrangement are specified as covered by the patent.

Manufacture of Gas.—Dinsmore, J. H. R., of Liverpool. No. 16,194; Nov. 8, 1888. [8d.]

This is a further modification of the "Dinsmore Process of Gas Making" concerning which the patentee says: "In the manufacture of illuminating gas from coal according to this invention, tar or other residual hydrocarbon liquid is introduced into a retort, either mixed with the coal or separately; and the products of distillation are passed through a cooled passage upon leaving such retort. The mode of operation is, therefore, the following:—Coal and tar are distilled in a heated retort, and become mixed therein, and the products of distillation flow through the retort from the points at which they are distilled to the exit passages of the retort, where they pass through an artificially-cooled passage, and are subjected to the cooling influence thereof. One of the effects of the production of gas in this manner is that the quantity and quality of the gas produced is augmented, and that condensible matters of a pitchy nature, and carbon, are arrested or condensed by the cooled passages, and are thereby prevented from coagulating or congealing on the surfaces of the pipes or other parts of the apparatus, and blocking them up. In the process of manufacturing gas from coal in retorts, in which coal tar is employed and distilled in conjunction with the distillation of the coal, it has been found that pitch and other like matters, due to the vapourization of the tar and not converted into permanent illuminating gas, become deposited upon the inner surface of the pipes, and they become stopped up thereby. According to this invention, the gases produced from the tar and coal in the retorts being subjected to the influence of the cooled passage upon leaving the retort, these matters present in the gas are arrested; and the process may be conducted continuously without interruption from the defects or hindrances above named. The retorts may be of the ordinary single or through type, or they may be provided internally with a plate, pipe, or partition, over which the gas may be caused to pass, and on to which the tar may be introduced. . . The cooled passage may be maintained at the required temperature by causing water or cold air to be circulated over it, and within a jacket; or it may be effected in any suitable way. It is preferred to arrange the cooling surface of this passage close to the retort-mouth, and such passage to be a portion of the ascension-pipe. In lieu of, or in connection with, the internal provisions above mentioned, the process may be carried on in retorts by placing the coal in one portion and leaving the other portion free, so that the gases pass through this free portion on their way to the cooled passage. In this portion, the tar may be distilled when introduced separately from the coal."



The illustration shows a sectional elevation and an end view of an ordinary closed retort with improvements according to this invention applied thereto. The coal is introduced into the retort, and carbonized in the ordinary manner; the retort having an ordinary mouthpiece and charging and discharging door. It is, however, fitted with a diaphragm D for guiding the gases in passing through the retort to the ascension-pipe. The passage through the ascension-pipe is cooled by water or other fluid surrounding it; such fluid being carried quite down to the metal of the mouthpiece. The tar in the example is introduced into the retort by a device E on to the diaphragm D; and it is preferably sent in under such a head as will cause it to fall well within the retort, and on to a portion of the diaphragm which will be red hot, in order to distil it rapidly and thoroughly. In operation, coal is introduced into the retort in the usual way, and tar is introduced at E. Both are distilled by the heat of the retort; the coal gases passing round the end of the diaphragm D and mixing with the tar gases as they pass away to the outlet passage. In passing through this passage (which is preferably of about 5 to 7 feet in length) the combined tar and coal gases are cooled; and by thus cooling, this passage, as well as those following, are said to be prevented from becoming blocked by pitch or other deposits. "The temperature to which the retort is heated may suitably be that denoted by a clear cherry red colour—*i.e.*, a medium gas-making temperature."

When the tar is introduced simultaneously with the coal (that is, coal and tar previously mixed together), it will be evident that the device E will not be required; also, although the patentee prefers to use the diaphragm D, its use may sometimes be dispensed with, "as may be deemed or found desirable."

Water Meters and Motors,—Greenwood, A.; communicated from C. Roux, of Le Creusote, France. No. 16,271; Nov. 9, 1888. [8d.]

This invention relates to apparatus which may be used either as a motor for driving machinery or for measuring liquids.

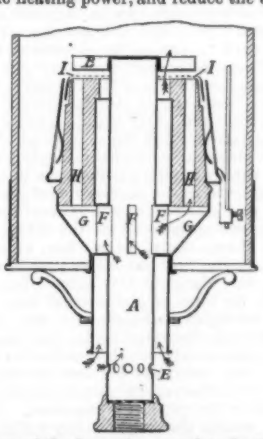
The apparatus in its simplest form consists of two pairs of cylinders placed parallel to each other; the one pair having a capacity (say) four times that of the other—being fitted each with a duplex piston. Between the two smaller cylinders is a water-tight chamber in constant communication therewith, and in communication with a supply-pipe. The large cylinders communicate severally with one of the smaller cylinders; thus cylinder A communicates by two passages with the opposite ends of cylinder C, and cylinder B communicates similarly with cylinder D. The space in cylinder D between its pistons, besides being in communication with the supply chamber, is in communication by means of passages with the opposite ends of cylinder A; and cylinder C is similarly connected with cylinder B. Thus all the cylinders are brought into mutual communication. The piston-rods of cylinders C and D are each furnished with a slide-valve, which cover exhaust ports in cylinders A and B respectively.

The action of the apparatus is as follows:—Suppose water to be admitted from the supply chamber, through cylinder D, to the passage leading (say) into the left-hand end of cylinder A, the piston being at the end of its stroke, and the piston of cylinder B being at about the middle of its stroke. The water, as it enters cylinder A, will force the piston of that cylinder to the right, until a passage leading to cylinder C is uncovered. Water will then flow by this passage to the left-hand end of cylinder C, forcing the piston of that cylinder to the right, and causing its slide-valve to uncover a passage leading to the left-hand end of cylinder B. The piston of this cylinder will then advance to the right, until an opening in cylinder B, communicating with cylinder D, is uncovered. Water will then pass to cylinder D, driving its piston to the left, and uncovering, by means of its slide-valve, the port in cylinder A leading to the right-hand end of that cylinder. The piston in this large cylinder will now be forced back to the left, until a second delivery passage in cylinder A is uncovered, when water will pass to the right-hand end of cylinder C, reverse the position of the slide-valve of its piston-rod, and thereby admit water to the opposite end of cylinder B. Before this reverse motion takes place, the exhaust will, of course, be open through the slide-valve which provides for the delivery of the water from the apparatus at every stroke of the main pistons.

Supposing it is desired to use the apparatus as a water-meter, it will only be necessary to carry a rod through the end of one of the main cylinders connecting it rigidly with the piston of that cylinder, and from this rod counting apparatus may be actuated indicating the number of strokes made by the piston, and consequently the amount of water displaced. If, however, the apparatus is to be used as a motor, being actuated either from an elevated reservoir or a hydraulic accumulator, the movements of the piston carrying the motor rod may be applied directly to actuate the piston of a force pump, or indirectly to produce a rotary motion.

Gas-Burners.—Hellman, J., of Vienna. No. 16,624; Nov. 15, 1888. [6d.]

This invention refers to "round gas-burners," more particularly to those intended for heating purposes; but it may also be employed in incandescent gas-lamps for lighting purposes; the object of the invention being to increase the heating power, and reduce the consumption of gas.



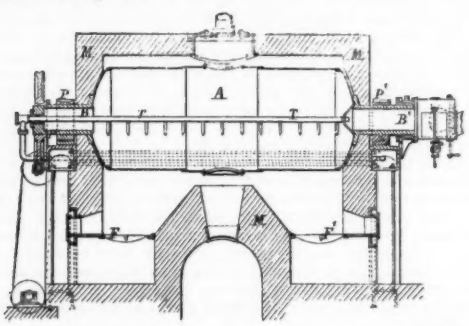
The notable feature of the invention consists in the extension of the tube A (supplying a mixture of gas and air) over the top of the burner, in such a manner that the closed end extends to its upper edge, or even

projects somewhat. When the closed top projects above the burner, that part of its circumference may be provided with ray-like strips B, of copper or any other metal, laid on edge and extending over the burner openings. In this case, the projecting gas-tube A is heated both directly and by means of these metal strips, more effectually and quickly than when it does not project or is not so provided. By heating the tube A, the mixture of gas and air in it is preparatorily heated; and in the same manner, the air is also heated which surrounds the proper gas-tube A and ascends to the flame. The result is said to be the production of a strong flame and considerable heat, and much gas is saved. The gas which passes from a supply pipe to the tube A, is mixed with air entering through openings E; and the mixture ascends into the tube in the direction of the arrows, fills the upper (closed) extremity, and is heated there. It then passes through slots or openings F into the chamber G; and from there through the channels H of the burner to the point of ignition. The annular surface of the burner head is closed by gauze I, which prevents any "backing" of the flame.

OBTAINING USEFUL PRODUCTS FROM THE REFUSE OR RESIDUES OF GAS PURIFIERS.—Dubois, C., of Marseilles, France. No. 7653; May 7, 1889. [6d.]

The cyanides contained in the old or refuse materials which have been employed in the purification of lighting gas have, the patentee remarks, been utilized in the manufacture of Prussian blue, and in the preparation of prussiates of potash; but the relatively small demand for these products, has until now prevented the complete utilization of these cyanides. The process therefore which he has invented, and which forms the object of the present patent, enables the whole to be utilized; and it is based on a conversion of the cyanides into ammonia, the flow of which is easy and almost unlimited.

This conversion is based upon the decomposition of cyanides at a high temperature. It is consequently sufficient, in order to obtain this decomposition, to heat in suitable apparatus the refuse materials which have been employed in the purification of lighting gas; and the ammonia and ammoniacal compounds produced are afterwards collected, either in sulphuric acid to form sulphate of ammonia, or in condensing chambers in order to extract ammoniacal liquids for further treatment. Nevertheless it may sometimes occur, the specification proceeds, that the whole of the hydrocyanic acid in the cyanides is not decomposed into ammonia, and that a portion thereof escapes. In order to collect the whole of this product, it is necessary to cause the vapours and gases escaping from the sulphuric acid to pass into a bath of milk of lime or into a solution of potassa or soda. Cyanides are thereby reformed, which may be subjected to further treatment. To facilitate the decomposition of the cyanides, and accelerate the operation, a current of steam, superheated or otherwise, is introduced into the apparatus or chamber in which the refuse materials are heated; and this steam, being condensed on leaving the apparatus, retains the ammonia and the ammoniacal salts produced.



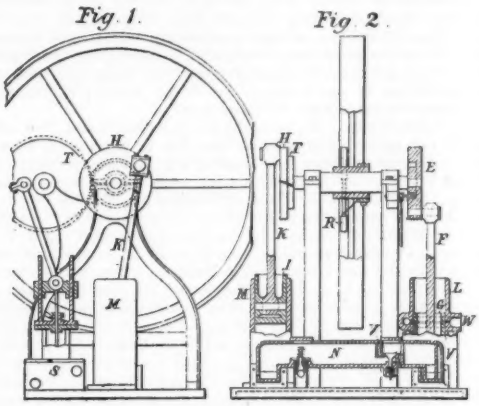
The process is preferably conducted in apparatus such as that illustrated. It consists mainly of a rotary retort A mounted on hollow trunnions B B^1 supported by suitable bearings P P^1, arranged outside a brickwork chamber M enclosing the retort, and provided at its lower part with grates or fireplaces F F^1 for heating the apparatus. The retort A is constructed with manholes or openings provided with covers for introducing and discharging the materials under treatment; and superheated or other steam can be injected into the interior by means of a steam-pipe T provided with nozzles. The driving gear and steam-pipe are attached to one of the trunnions (B) and the gaseous products generated escape through the other one (B^1). In practice, the distribution pipe extending into the interior of the retort may be dispensed with; the steam being simply caused to enter the retort through the hollow trunnion. This steam carries over with the greatest rapidity the gaseous products and the sulphur which is vaporized without prejudice to the chemical or mechanical action that it may produce in the presence of such complex products as those contained in the refuse materials employed in the purification of gas.

The process thus performed is said to present the important advantage of extracting in one operation from the refuse materials employed in the manufacture of gas—1stly, the sulphur, which may be estimated at 40 per cent., and, 2ndly, the ammonia contained in the ammoniacal salts of these products. Moreover this process has the advantage not only of extracting in the form of ammoniacal salts the ammonia contained in the old purifying materials, but also of decomposing the hydrocyanic and ferro-hydrocyanic acids, and converting them into ammonia or ammmoniacal salts which thus further increase the output. When the old purifying materials are introduced into the retort and the apparatus is started, the vapours generated are conducted to a condensing chamber where the sulphur is deposited. This chamber, being sufficiently heated, retains the sulphur only whilst the vapours being invariably charged with ammonia and ammoniacal salts are conducted to refrigerators wherein they are condensed and yield ammoniacal liquids, or they are conducted over sulphuric acid in order to form sulphate of ammonia. The heat generated by the reaction is sufficient to evaporate the water.

GAS-ENGINES.—Thompson, W. P.; communicated from H. C. Covert, of New York. No. 12,472; Aug. 7, 1889. [8d.]

This invention relates to the combination in a gas-engine (with the power cylinder and pump cylinder) of a valve chamber extending from one cylinder to the other, and establishing communication between the two chambers sustaining a gas-valve, check-valve, and ignition-valve.

Fig. 1. *Fig. 2.*



The shaft of the engine carries a fly-wheel, which may also be used as a belt wheel, and is supplied at one portion with a disc E driven by a connecting-rod F leading from the main piston G, and at another point with a disc H, which drives the gas-pump piston through the rod K. L is the power cylinder, within which the explosive force of the gas is utilized to drive the main piston G. M is the pump cylinder, into which the fuel is drawn, and from which it is forced into the explosion chamber. These two cylinders are arranged in line upon one bed-plate. N is a chamber extending on one side a sufficient distance to establish communication between a port leading into the pump cylinder and a port leading into the main cylinder L; and in connection with this chamber the valves all operate. Within the chamber is an air and gas valve which, as the pump piston I is retracted, rises and admits gas, and at the same time admits a quantity of air from the exterior through separate channels. This mixture enters the pump cylinder and the valve chamber. When the piston I reaches its highest point, the valve on it closes, and upon the descent of the piston the fuel is forced past a check-valve arranged for the purpose, and into the chamber in which it is to be exploded, of which chamber the space beneath the main piston G is a port. The explosion is effected through an ignition-valve applied upon the valve-chest in the usual way.

At S is a water or other pump, disposed on the base and driven from the main shaft by gearing T and suitable connections. Any other machine may be put in place of the pump. V are chambers through which a supply of water may be employed to prevent over-heating.

APPLICATIONS FOR LETTERS PATENT.

16,009.—LAWSON, J., "Improvements in oil-gas producing apparatus." Oct. 11.

16,045.—CUTHBERT, R. A., "An improved reflector for lamps, for reflecting and diffusing the back-light of wall-lamps and bracket gas-lights." Oct. 11.

16,138.—TATHAM, E., "Improved gas or gaseous mixtures for use in the production of light, heat, and power." Oct. 14.

16,142.—TATHAM, E., "Improvements in coal gas and like gases, and in the manufacture thereof." Oct. 14.

16,204.—GREEN, W. H., "Improvements in gas-engines." Oct. 15.

16,388.—BREMNER, G. W., "Improvements in lamps for destroying sewage gas and noxious vapours." Oct. 17.

16,391.—LINDEMANN, O., "Improvements in gas and petroleum engines." Oct. 17.

16,393.—GIRARDET, P. L., "Improvements in or relating to lamps for illuminating or heating purposes." Oct. 17.

16,441.—GRAY, T. H., and BROMHEAD, S. S., "Improvements in the preparation of coal gas for combustion." Oct. 18.

16,450.—CUTLER, S., "Improvements in apparatus for heating and circulating water or other liquid in tanks, stills, the cups of gasholders, or purifier lutes." Oct. 18.

16,454.—NOBES, G., "Improvements in the construction of self-acting gas-cocks for checking the spread of conflagrations." Oct. 18.

16,486.—COZE, A., "Improvements in gas-retorts, and in apparatus connected therewith." Oct. 18.

16,488.—WIGHAM, J. R., "Improvements in lighthouse illumination, Oct. 18.

16,489.—MORRIS, F., and VESTRANT, L. VAN, "Improvements in apparatus for charging inclined gas-retorts." Oct. 18.

16,539.—TELFER, J., "Improvements in gas-stoves to be applied to ordinary gas-burners." Oct. 19.

16,555.—IMRAY, O., "Process for obtaining salts of thorium, zirconium, and like metals from their ores or from waste residues of hoods used for incandescent gas lighting." A communication from W. M'Kean. Oct. 19.

THE BRISTOL POLICE AND THE RECENT STRIKE OF GAS WORKMEN.—A rumour was recently current in Bristol to the effect that the Directors of the Gas Company were about to make a representation to the Home Office relating to the action of the police when the Company tried to get men to take the places of their *employés* who were on strike. It has now been ascertained that the Directors have no such intention; but will, it is said, send an expression of dissatisfaction to the Watch Committee.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE LONDON GAS COMPANIES AND THE PROPOSED ELECTRIC LIGHTING OF THE CITY.

Sir,—In the Journal of to-day, reference is made to the report of the Committee on the proposed electric lighting of the City being referred back for reconsideration. May I be permitted to suggest that an opportunity is thus afforded the Directors of the Gas Companies to take a new departure in public gas lighting. Nothing is settled as to the new light. Let the Companies put themselves upon a fair platform of competition, by offering to efficiently and satisfactorily light the whole of London upon terms to be agreed—not as now, "so much per lamp, burning not more than 4 feet per hour;" but to provide and regulate as to size, kind, and number the lamps to secure the "efficient and satisfactory lighting" of the thoroughfares.

Mr. Livesey alluded, at the Commercial meeting, to the splendid piece of gas lighting along the sea-front at Brighton; and all who have seen it must agree with him. Why could it not be adopted in London? I suppose the reply is: "That is for the Commissioners, or other local authorities to resolve upon;" but this is just the mistake. The lighting authorities of London do *not* move in that direction. It would be manifestly judicious, I think, for the Companies to do so. Work the whole thing out, and offer to light for all public purposes upon the most liberal terms—looking broadly at the situation—even a trifle above cost price.

At this juncture, the point to be aimed at is to educate the public eye to what perfection gas lighting can be brought. This would bear fruit in a variety of ways; and would be profitable in the end.

London, Oct. 23, 1889. I. A. Crookenden.

GADD AND MASON'S PATENTS.

Sir,—Mr. Pease has indulged in a criticism of the specifications of my inventions, and made certain statements, which I think need correction at once. His opening remark points to the idea of trying to escape Gadd and Mason's patent, by a technical objection to the suggested want of detail in the provisional specification. This, Sir, being purely a matter for the Courts to deal with, I shall not now attempt to further refer to it.

I am bound, however, to notice criticism and statements involving direct contradictions on Mr. Pease's part. He says (of course, in his view) that guides play the essential part both in the original patent and in the provisional specification of the second patent; but in the complete specification just published, guides cease to play any part at all. Apparently, he is utterly oblivious of the fact that every word, or nearly so, of the provisional specification is *repeated* in the complete. He appears just as oblivious of the fact that the wire ropes, &c., act as guides, which may or may not (as stated) be supplemented with the ordinary guiding in the tank. I must also add, that *my* view of the original invention is that it was to entirely abolish the upper guide-framing. And it was because other ways of doing this were possible, that the second patent was applied for. Will anyone say that a mode of guiding without framing was ever demonstrated before?

Again, Mr. Pease says that it was well known to all readers of the gas papers months ago that his plan involved the use of wire ropes. I never saw it so stated anywhere; and such a vague statement, if it existed, would scarcely convey any idea of an invention. I trust, however, that Mr. Pease's slightly veiled sarcasm as to originality does not involve a charge of copying from any source his ideas, even in detail. Because such a mode of expressing disappointment would be not only undignified, but utterly false. I filed my specification without the remotest notion of what his plan was; and all I saw about it was the article entitled "A Solution of the Problem of Gasholder Guiding," which appeared in the Journal for April 30 last. My chief drawings were prepared, however, so long ago as 1888. Added to which, Mr. Pease himself afterwards says that nobody has as yet seen his specification.

As to the bottom curb, my specification does not confine action thereto, although "my studies on the subject" have led me to the conclusion that there is nought gained by leaving it.

Finally, if Mr. Pease thinks that elaboration of detail will be enough to constitute a valid patent, he is welcome to his opinion; but I prefer to back the so-called crudity, for legal purposes. Nevertheless, for practical use, I am, as before stated, not at present prepared to advise it for large structures.

Manchester, Oct. 24, 1889. W. Gadd, C.E., F.R.M.S.

THE OXYGEN PROCESS OF GAS PURIFICATION AT RAMSGATE.

Sir,—In your issue of the 15th inst., you were good enough to favourably notice my work in connection with the separation of oxygen by Brin's process. In fairness, however, it should be recorded that I have been ably assisted by the whole of the engineering staff of that Company; and in connection with its adaptation to gas purification, the automatic reversing gear invented by Mr. K. S. Murray, and the proportional meter of my late assistant, Mr. Hicks, deserve special mention. By the aid of these inventions, manual labour is almost entirely dispensed with, and the process made a reliable mechanical operation of the most simple kind.

Ramsgate, Oct. 26, 1889. William A. Valon.

Bombay Gas Company, Limited.—The statement of accounts of this Company for the half year ending June 30 last, which will be presented at the half-yearly general meeting on the 6th prox., shows an increase of £1900 in the receipts, as compared with the corresponding period of 1888. Of this sum, the gas and meter rental contributed £816. The loss on exchange for money remitted during the six months amounted to £10,188; being an average rate of 1s. 4¾d. per rupee. Of this sum, £9211 has been charged to the profit and loss account, and the balance written off the exchange equalization account. The amount at the credit of the profit and loss account is £8430 7s. 11d.; making with the balance brought forward a total of £8628 5s. 5d. for appropriation. Out of this sum the Directors declared an interim dividend of 3½ per cent. (free of income-tax) for the half year; leaving £228 5s. 5d. to be carried forward.

Legal Intelligence.

HALIFAX COUNTY COURT.—Wednesday, Oct. 16.

(*Before Mr.* J. Heaton Cadman, *Judge.*)

THE SOWERBY BRIDGE LOCAL BOARD AND THE LUDDENDEN FOOT GAS-WORKS.

This was an action brought by Messrs. Whitworth and Co., manufacturers, of Luddenden Foot, to recover from the Sowerby Bridge Local Board £74 19s. 3d. in respect of the costs of preparing the conveyance, &c., in connection with the sale of the plaintiffs' gas-works to the defendant Board. The case had been remitted from the High Court.

Mr. Byrne appeared for the plaintiffs; Mr. J. F. Leese for the defendants.

Mr. Byrne stated that the case was brought under section 82 of the Lands Clauses Consolidation Act, by virtue of which plaintiffs claimed to be entitled to the cost of the conveyances, &c. By an Act, dated June 28, 1861, the Sowerby Bridge Gas Company were incorporated for supplying gas within a limited area, and had power to agree with the owners of any land which they might think requisite or proper for the purposes of their undertaking. Subsequently the Local Board bought up the Company's works, and carried on their business. Messrs. Whitworth and Co. had gas-works and mains of their own in the same neighbourhood, but outside the area of the Board's supply.

Mr. Leese pointed out that section 5 of the Local Act prescribed the limit of the district in which this gas might be supplied; and Luddenden Foot was within that limit. Section 46, however, prescribed the limit beyond which the Local Board might not put down gas-making plant; and Luddenden Foot was outside that limit.

Mr. Byrne said that whatever rights the Gas Company had, the Local Board acquired. In order to obtain the plaintiffs' gas-works, which the Board desired, it was necessary to seek additional powers to those contained in the Act of 1861; and they obtained a Provisional Order, which provided that the Act of 1861 should be altered so as to enable the Board to establish and maintain gas-works at Luddenden Foot. In pursuance of this Act, there was, on Nov. 27, 1887, a covenant of the surrender of Messrs. Whitworth's gas-works, and a grant of certain rights and easements in connection with the mains, pipes, &c.

Mr. Leese said his friend must put in the agreement (signed by both parties), in pursuance of which the deed was prepared.

It transpired that each party had a copy of the agreement named; but neither was stamped.

Mr. Byrne said his friend might put in the agreement if he chose, as part of his defence; but for himself he did not want it, because he was claiming under section 82 of the Public Act. He further stated that part of the defence was that the Lands Clauses Consolidation Act did not apply; but he argued that it did apply.

Mr. Leese (who put in the agreement in question, though unstamped) contended that the property in question was not within the cognizance or authority of the Act of 1861, and that the Provisional Order did not bring it within that Act so as to make section 82 of the Lands Clauses Consolidation Act applicable, because the agreement was made before the Order was issued, as proved by the reference in the Order itself, and also by clause 9 of the agreement, which declared it to be an agreement subject to the approval of the Local Government Board. He then went on to show that the spirit of the Lands Clauses Consolidation Act—and indeed the terms of that Act—had reference only to such lands and property as were within the authority of the Act of 1861; that these were not within that authority; and that therefore the Act did not apply. He further submitted that the bargain between the parties, contained in the agreement referred to and now put in, was absolutely inconsistent with the provision, under section 82, by which all costs were to be paid by the vendees. He contended that the defendants had sought to carry out the agreement, which was quite natural, without the provision of any Act of Parliament at all.

Wednesday, Oct. 23.

His Honour gave judgment to-day. He said he was of opinion that the Lands Clauses Consolidation Act applied to the agreement, and that the Provisional Order dovetailed into the Local Act, and must be read as part of it. This being so, judgment would be for the plaintiffs, with such costs as the taxing-master might allow.

WESTMINSTER POLICE COURT.—Friday, Oct. 25.

(*Before Mr.* Sheil.)

THE COMBINED WATER SUPPLY QUESTION.

To-day the *Chelsea Water Company*, represented by their Secretary (Mr. G. H. Gill) and other officials, were summoned for illegally and without just cause cutting off the water supply of the premises situated at No. 18, Brompton Road, in the occupation of Mr. Ebenezer Botting, watchmaker, contrary to the provisions of the Water Companies' (Regulation of Powers) Act, 1887, and other statutes.

Mr. Rickards, who appeared in support of the summons, said the facts of the case had already been explained to the Court (see *ante*, p. 751). It would be remembered that the supply to the three houses Nos. 14, 16, and 18, Brompton Road, was through one pipe from the main; and because the rate was unpaid at No. 14, now untenanted, the water was cut off from all the premises, although the complainant and his neighbour at No. 16 did not owe the Company anything. The houses all belonged to one landlord. He relied on the provisions of the Act of 1887.

Mr. Sheil said it was quite clear that this Act only applied where the owner and not the occupier was liable for the rate. A case for a penalty had altogether failed to be established; but there might be cause of action for damages in a civil court.

Mr. Bodkin, who appeared for the Company, said the Company would be very glad to defend such an action. In this case there was no agreement between the landlord and the Company.

Mr. Rickards: I did not know I should be bound to confine myself to the section of one Act.

Mr. Sheil: Show me any other.

Mr. Rickards said he could not find one.

Mr. Bodkin: After that candid admission, I ask that the summons may be dismissed with costs. We do not ask for heavy costs. If Mr. Botting chooses to apply to the Company for the renewal of the supply, and lays a separate communication-pipe, which he is legally bound to do, he will be attended to.

Mr. Sheil remarked that he was strongly of opinion that the Company ought to insist on separate communication-pipes.

Mr. Bodkin said the Company were fully alive to the importance of such pipes; but in old houses, like complainant's, they did not know themselves the condition of things till the ground was opened.

Mr. Rickards admitted that he could not carry his case further.

Mr. Sheil therefore dismissed the summons, with one guinea costs.

Miscellaneous News.

GAS WORKMEN AND THE LABOUR QUESTION.

The difficulties which have been threatening between the Bradford Corporation and their gas-workmen are practically at an end. A deputation of the men had an interview last Tuesday with the Sub-Committee of the Gas Committee, and the grievances of which they complained were discussed. The interview was most cordial; and its result was that the Sub-Committee (which was presided over by Alderman F. Priestman) laid before the deputation proposals for their consideration. It was stated that the carrying out of these suggestions would involve additional expenditure amounting to £5000 per annum in wages. The following were the proposals:—(1) The stokers to be relieved of all coal trimming and breaking of coke, wheeling, and slaking; the Corporation to employ the men for this purpose at such wages as they may deem proper. (2) Extra men to be employed for scurfing retorts. (3) Stokers to be paid at the rate of time-and-a-half for work done between 6 a.m. and 10 p.m. on Sundays. (4) Wages of yard-men and purifiers to be advanced 1s. per week. (5) All permanent workmen to have a week's holiday with pay at 22s. per week. These terms were submitted in the evening to a full meeting of the men. Discussion elicited that the men employed at the Valley Road and Thornton Road works were mostly satisfied with the proposals; but there was some hesitation on the part of the men at the Birkshall works, who complained that they were called upon for the same money to do a good deal more work than their fellow-labourers at other works. It was unanimously agreed, as a condition to the acceptance of the offer, that the Committee should be asked to sanction time-and-a-half payment for Sunday labour to yard-men as well as to stokers. The conciliatory attitude of the Committee was freely acknowledged by members of the deputation; but one or two speakers, apparently representative of the feeling of the Birkshall men, urged that the proposals were unsatisfactory, as bearing upon the position of those men. It was, however, pointed out by one of the leaders of the movement that, considering the fact that the men were only recently organized, they had achieved a very successful result. He had advised them to await the return of Mr. Alderman F. Priestman; and they now saw the conciliatory attitude of the Committee. He thought their duty was clear—namely, to accept the proposals that were made. With all due respect to the Birkshall men, he urged that they were too late in the field. They ought to have come forward when the demands were being formulated; and he would ask them now not to stand in the way of this attempt at conciliation which was being made by the Committee. It seemed to him that the things left out of the offer were not worth five minutes' talk, and that there was nothing of any substantial value which could still be contended for. Moreover, by accepting the terms, they would earn the respect of all men who knew what it was to go manfully about such grievances as theirs. Eventually the meeting agreed to the terms offered, by a majority of 62 votes to 2. The proposals of the Sub-Committee, as agreed to by the men, were ratified on the following day. A deputation representing the men met the Gas Committee, and expressed their willingness to agree to the proposals of the Sub-Committee; and the Committee on their part formally adopted them as the conditions under which the men should work. It is stated that the deputation expressed their satisfaction at the handsome manner in which the men's grievances had been met.

Meetings of the workmen employed by the Newcastle and Gateshead Gas Company have lately been held, with the result that certain demands have been formulated and submitted to the Directors. The stokers ask for an eight-hour shift, with four charges; double time for Sundays, Good Friday, and Christmas Day, with an addition of 1s. 6d. per week good-time money. The pipe-cleaners claim an eight-hour shift, with present pay; the Elswick door-men, pay at the same rate as is given at the Redheugh works; yard-men, splint wheelers, and slow firemen, 4s. for an eight-hour shift; yard labourers, an advance of 2s. per week of 54 hours; engine-men and boiler-men, an eight-hour shift; lime sifters, the same pay and hours as box-men; the ammonia-house men, an eight-hour shift; bag carriers, the same as box-men; fire-men and coal wheelers, an eight-hour shift and 1s. 6d. good-time money; door-men, eight hours and 1s. 6d. good-time money; exhauster engine-men, 48 hours' week, at £1 13s. 10d. per week; the boiler-men, the same hours, at £1 12s. 6d. per week; the bricklayers' labourers, double time for Sundays, Good Friday, and Christmas Day, and an advance of 2s. 3d. per week; the scrubber-men, an eight-hour shift at existing wages; and the labourers, 2s. per week advance, with certain privileges.

The gas workmen in the South Devon district have lately organized a branch of the Gas Workers' Union, and upwards of 100 men, residing in Plymouth, Stonehouse, Devonport, and the outlying places, have enrolled themselves as members.

The Elland Gas Company have advanced the wages of their stokers 2s. a week; thus making their remuneration 5s. a day for an eight-hour shift.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, 9, Queen Street Place—Mr. Horatio Brothers, C.E., in the chair.

The Secretary (Mr. T. Guyatt) read the notice convening the meeting; and it was agreed to take as read the Director's report and accounts for the year ending June 30 last, an abstract of which was given in the Journal for the 15th inst. (p. 757).

The Chairman, on rising to move the adoption of the report and accounts, said that before putting the motion to the meeting, he had a few remarks to make on the balance-sheet and the conduct of the undertaking in general during the past year. He thought that after a perusal of the report and accounts, the shareholders would come to the conclusion that the Company had had a very satisfactory year and done very well. He considered that the condition of the accounts was really better than appeared to be the case on paper, because they would see from the receipts that the increase in the value of the gas supplied to the public lamps was £1415, and of that supplied to private consumers, £558, making a total increase of £1973, or 17·3 per cent. The residual products realized £140 less than in the preceding year, which was an abnormal one, for they sold a large quantity of coke from their old stock. The net receipts for the year were £1827 more than in 1888. On the expenditure side of the accounts, the cost of coals showed an increase of £538; wages, £89; and repairs and maintenance, £373. There was an increased expenditure of £1178, which, deducted from the total increase in the receipts for 1889, showed a profit of £649 more than last year, but the balance for the year only showed an increased profit of £173, which was accounted for by the charging of £703 for renewal of retort-house and coal-store. The working had considerably improved. Coal cost 39s. 8d. per ton against 35s. 6d. in 1888. The amount of gas made per ton of coal was 10,145 feet; against 9928 feet last year. Leakage had been reduced from 11½ per cent. to 7½ per cent.—a very great improvement indeed. The balance-sheet showed that the amount owing to creditors had increased £1229; but that owing to the Company had increased £1764. The reason of this increase was that the Provincial Government, because of the famine and the drought, had not been able to levy the duties as they did previously, and so the Company would have to wait for a time. They would see that £1000 had been added to the reserve fund, besides the increased dividend, and the carrying forward of a larger amount than last year. They must make up their minds to pay a higher rate of freight for their coal than they had been paying, and the price of coal itself was higher. Though this might affect the profits, as they were certainly earning more than 10 per cent., he did not see why they should not continue to pay the dividend they now declared. He then moved—"That the report and accounts be received and adopted."

Mr. J. Darell Blount seconded the resolution, which was carried unanimously.

On the motion of the Chairman, seconded by Mr. R. King, it was decided to add £1000 to the reserve, making the amount of that fund £3000; and to pay dividends at the rate of 5 per cent. (less income-tax) on the preference shares, and 5½ per cent., free of income-tax, on the ordinary shares for the six months.

Mr. F. A. Wallroth proposed, and Mr. J. W. Miers seconded, the re-election of the retiring Directors (Mr. J. Darell Blount and Mr. F. W. Brothers); and the motion was carried unanimously.

Mr. R. L. Andrews then moved that the Auditor (Mr. Robert King) should be re-elected.

The proposal was seconded by Mr. Miers, and carried unanimously.

Mr. R. L. Andrews, in proposing a vote of thanks to the Chairman and Directors for their able management of the Company's affairs, said there was no doubt that the Ceara Gas Company was a very nice little concern. They knew there were many other similar Companies in South America and Brazil; but none were so secure as the Ceara. That was in a great measure due to the Directors and the Manager and officers out there.

Mr. R. King seconded the motion, which was unanimously carried.

The Chairman, on behalf of himself and his colleagues, thanked the shareholders for the resolution that had been passed, and said they might rest assured that the Directors did the best they could in the interests of the Company. He then said that the staff should be recognized in the votes of thanks. They had a very able Manager, in whose ability and integrity they had the greatest confidence; and in speaking of their Secretary praise would be superfluous.

Mr. F. A. Wallroth seconded the motion, which was unanimously carried; and the meeting then terminated.

THE DANGEROUS OVERHEAD ELECTRIC LIGHT WIRES IN NEW YORK.

Serious Casualties—Adoption of Decisive Preventive Measures.

In a paragraph which appeared in the Journal last week, it was stated that the electric light had been stopped in New York, owing to a dispute between the authorities and the companies supplying that illuminant on the subject of the overhead wires. Of late the deaths which have resulted from workmen and others coming in contact with these "death-dealers," as they are called in the city, have lately been so numerous—one a day for two or three days in succession—that the matter has been noticed by the coroners, and finally by the Mayor (Mr. Grant), who has caused a clean sweep to be made of all wires which are not properly insulated. According to accounts we have received from an esteemed correspondent in New York, as recently as the 8th inst., a lineman of the Manhattan Electric Light Company was killed while at work repairing the electric light wires in Grand Street. The unfortunate fellow was a man of only 39 years of age, and of very fine physique and in perfect health, when he started his job; but in the course of his work he accidentally grasped a "line" wire, and received the full force of the electric current. He fell to the ground, fracturing his skull in the fall. The *post mortem* examination revealed a burn, extending to the bone, in the palm of the hand which had touched the wire, and other indications of an electrical shock. These, combined with the injury to the skull, were the cause of death. On the very next day a lineman of the Bell Telephone Company was engaged in repairing a broken wire, when it unexpectedly fell across the electric wires, and he received a shock which threw him to the pavement. The telephone wire, through the contact, became white hot, and fell in pieces to the ground. While the lines were entangled, the electric wire current was so strong that it broke two "drops" in a neighbouring telephone office. Had the day been wet, the workman would probably have been killed. As it was, he escaped with but comparatively slight injuries.

The recurrence of such casualties as these, although treated as lightly as possibly by the press, roused the indignation of the Mayor, and led him to address a letter to the various electric light companies and the Subway Construction Company, informing them that the subject of the dangers resulting from the use of overhead wires would be brought before the Board of Electrical Control at a special meeting called for the purpose. This meeting was held on the 9th inst., and was largely attended. The proceedings began with the reading, at the Mayor's request, of a letter from the Board of Coroners respecting the death of various victims of overhead electric wires. Then the Mayor's letter was read, followed by responses from the Manhattan and Harlem Electric Light Companies. They asserted that they were heartily in accord with the authorities in their efforts to hasten the change to underground service; declared that they were then using the subways in as great a degree as possible; and insisted that their overhead wires were highly insulated. An answer from the United States Illuminating Company was next read, which stated that there was urgent need for more subways. The Company complained also of the dilatory work of the Construction Company in building the conduits, and asked to be allowed to construct their own subways. The Mayor was evidently not much impressed with these responses; and asked if the representatives of the Companies present had nothing to say upon the question. Mr. Morris, of the Mount Morris Company, asserted that his Company had not caused any deaths, but were willing to put their wires into the subways as fast as they were ready, and urged the rapid construction of them. Mr. S. G. Young, the Electrician of the Company, said he thought that the accidents were caused by imperfect insulation and by the overloading of the circuits. The Mayor asked if a wire carrying an alternating current could by insulation be made safe for handling. Mr. Young thought it could; and he said he would be willing to handle these wires, as he had often done. Accidents were caused by old wires. "Where are these wires which you describe as safe?" asked the Mayor. Mr. Young said that his Company had one in a street just below their station, and that its connections were made with tape. He admitted that it was not insulated. The workmen, however, could make the connections with live wires in safety. "Yes," answered the Mayor, "you call them 'safe' but we get the news of all who touch them through the coroner's office." The Mayor was very much of the opinion that the wires could not be touched without danger of instant death. Mr. Spear, of the Brush Company, and Mr. Jackson,

of the United States Company, admitted in answer to the Mayor's questions, that it was difficult to make overhead wires safe. Storm breakage, contact with other wires, and various causes operated against the most careful insulation. Mr. Jackson frankly said he would not like to touch any of these "safe" wires, or see any one else touch them. When pressed with further questions, all the Companies' representatives clamoured for more subway facilities, and wanted them without delay. The Engineer of the Construction Company (Colonel Kearney) defended his Company against the charges of dilatoriness; and called attention to the policy of obstruction maintained for years by the electric light companies.

At this point, one of the Commissioners (Mr. Gibbens) remarked that, if he understood Mr. Jackson correctly on the matter of overhead wires, he would vote to refuse all applications for such wires or lamp connections; and would submit a resolution that no more circuits of the kind should be allowed to be operated. But he explained that he did not agree with Mr. Jackson; and then there followed a long discussion between Mr. Gibbens and Mr. Jackson as to whether the accidents were due to the impossibility of the wires being properly insulated or to the fact that they were not so insulated, and the overloading of the circuits. Mr. Jackson would not answer this question; whereupon Mr. Gibbens said he did not want any other sort of answer. Mr. Wheeler, the electrical expert of the Board, was then asked by Mr. Gibbens: "Is it a fact that wires cannot be properly insulated, or that they are not so insulated, as to be made safe?" Mr. Wheeler said he thought they could be made safe, and that if the rules of the Board were carried out, the accidents would not occur. Here the Mayor caused something like a sensation by saying to Mr. Wheeler: "Then you should feel some responsibility for these deaths." "I do not," answered Mr. Wheeler. "I do," said the Mayor; "and I think you have put yourself in a position to somewhat justify the presentment of the Board of Coroners." "What more can I do?" asked Mr. Wheeler. "My orders have not been carried out." Mr. Gibbens said the rules had been carefully drawn by the expert, and that Mr. Wheeler had done everything in his power to see that they were carried out with all the force at the command of the Board. He added that if the Board's regulations were enforced, accidents could not occur. "Then," said the Mayor, "let us see that they are enforced. Let us call on the representatives of the Companies and see that the wires are properly insulated. I am frank to say that I do not agree with the opinion that the wires can be made safe; and I am not ready to say that I am responsible for these deaths, because they could have been avoided under the rules of this Board. Before I would take that position, I would order every electric light wire down at once. I would order them down to-night, even if we did not have an electric light in the city after dark." (This remark caused some consternation among the Companies' representatives.) Mr. Moore, a representative of the East River Company, said the accidents were caused by defective insulation. The wires of his Company were all right. It was the old wires that caused the damage. "If these wires could be made safe," said the Mayor, "and the Companies have not made them so, I move that the Board instruct the electrical expert to have removed immediately all overhead wires that under his statements are not properly insulated. I will add that if I embarrass the Companies by this course, I for one will consider the applications for permits to construct their own subways at the next meeting." Mr. Gibbens suggested that the resolution should read so that the wires taken down be replaced by wires that were properly insulated. "I don't want any overhead system," said the Mayor. "The Companies say they are ready to go underground; and we should not stand in their way." Mr. Gibbens wanted to know what would be done while the subways were building. "Rather than have another death occur, and feel that I was in any possible way responsible," said the Mayor, "I would let every electric light in the city go out, and stay out. I will not be responsible for any more murders."

After this a long defence of the Subway Company was made by Mr. Lauterbach, their representative. He prefaced what he had to say by a sketch of the Company's fight with the electric light companies, and the struggle they had until the Mayor's advent to office. In answer to some questions of a critical nature that had been asked by the Mayor, he said that the Company had done the very best it could under the circumstances. He opposed the suggestion that the electric light companies should be permitted to build their own subways. There was a question as to whether this could be done legally. Mr. Wheeler H. Peckham followed, as the representative of the Standard Electrical Subway Company, which, he said, had been recently organized, and was ready to make contracts to build subways. He did not believe that the law was all on the side of Mr. Lauterbach's Company. The new Company would dispute this contention. Mr. Peckham thought the work should be divided up and finished as soon as possible. The Mayor said the opinion of the Corporation Counsel would be sought, so that the question of the standing of the Board in relation to new contracts might be determined.

Coming back to the question of insulation, Mr. Gibbens made some remarks which led the Mayor to say he believed insulation was as much a mystery to the electrical experts as electricity was itself. Finally the question came up on the Mayor's motion. He said he would accept an amendment to have the current shut off until the wires were made safe and the electrical expert certified to it. "Then I could not sanction the lighting of electric lamps in a single circuit in New York to-night," said Mr. Wheeler. After some more discussion, in which the Mayor took a very decided stand, Mr. Gibbens asked for a short adjournment; and this was granted. In the interval, the matter was talked over by Mr. Gibbens, the Mayor, and the Corporation Counsel, especially in regard to the power of the Board to plunge in darkness a large and important portion of the city. On re-assembling, the Mayor offered the following as a substitute for his former motion:—"Resolved, that notice be given to all companies operating and furnishing electric lights on overhead wires in the city of New York, to discontinue the use of such overhead wires as are not properly insulated until such time as said wires shall be certified to by the expert of this Board to be in proper condition." This resolution was adopted. The Mayor then said that the responsibility for any more deaths would now rest upon Mr. Wheeler. The latter asked if he must satisfy himself as to each particular wire. "Yes," answered the Mayor, "and I want you to understand that if the wires are not properly insulated—if they are dangerous—they must be taken down."

The proceedings then closed.

The necessity for the decisive steps taken by the Mayor, as recorded above, is shown by the following account, extracted from the *New York Tribune* for the 12th inst. (three days after the meeting), of the shocking fatality which occurred on the afternoon of the previous day, as briefly reported in our columns a fortnight ago:—

The series of fatal accidents from electric light wires which has caused such a public outcry against overhead wires, and which has led Mayor Grant to take vigorous steps against such negligence, had a culminating butchery yesterday afternoon. A lineman, while at work on a pole on which there were no electric light wires except near the ground, was killed by an electric shock, and the body, with four wires burning into it, hung in full view of thousands of people for three-quarters of an hour. John E. H. Feeks was a lineman in the employ of the Western Union Telegraph Company, and yesterday, just a few minutes before one o'clock, after finishing his dinner, he climbed the pole on the south-west corner of Chambers and Centre Streets, to remove some "dead" wires. The pole is a tall one, and has a large number of wires on it—some of them telegraph, others telephone, police and fire alarm, while two of them, which are about half-way up, belong to the East River and the Manhattan Electric Light Companies. There are 14 cross-bars on the pole. Feeks climbed up slowly, and on reaching the first cross-bar stopped to get out the tools which he intended to use. He then continued his climb. He was on the east side of the pole. The wire that he wished to take down was strung on the fourth of the cross-bars, pointing north and south; and when Feeks reached this, he put his head and half his body between it and the bar above, and reached over to catch hold of the "dead" wire. The neighbourhood is a busy one in the middle of the day, and several people were looking at the line-man at his work. They saw him catch hold of a wire with his right hand; and then in an instant his legs stiffened, and he fell forward, until his face and neck rested on two wires. Blue smoke began to curl up from his hand where it touched the wire, from his face and neck, and also from his left foot, which had caught on a wire that ran diagonally across the street. By this time the spectators realized what had happened, and were horror-stricken at the sight. The first thought was to rescue him from his position; and a long ladder was procured and placed against the pole. Martin Benson, another lineman employed by the Western Union Company, climbed up the ladder to get his companion down; but he had not gone far before the wreathing smoke warned him that to touch the body with bare hands meant a shock and possibly death. He de cended, and a request was sent to the United States Electric Light Company to send linemen with proper implements to take down the man. The accident occurred at a few minutes after one o'clock; and it was half-past one before the linemen arrived. In the meantime the excitement was intense. Thousands of people had gathered, and Centre and Chambers Streets were densely crowded; while the windows and even roofs of all the neighbouring houses were filled with people. The body was held at an angle of about 45 degrees by the wires, resting in a life-like attitude. The left arm was clasped around the lowest of the cross-bars pointing east and west, while the other arm was bent and the hand was clenched about a wire, which passed between the second and third fingers. Blood was dripping from the hand, face, neck, and the foot which touched the wires. Across the upturned face was a terrible gash running through the mouth and almost from ear to ear. Occasionally a puff of smoke went up from the mouth and nostrils. Police Captain Dakin, of the City Hall Precinct, called out all the available men of his precinct and obtained assistance from the Fourth and Sixth precincts, to keep the crowd back. An ambulance was sent from the Chambers Street Hospital; but when it arrived it was evident that an undertaker's waggon was wanted, and the ambulance was sent away. It was a long time before the linemen sent by the United States Company (John Cunningham and William M'Donough) arrived. The former, his hands encased in rubber gloves, was the first to mount the ladder. He carried nippers for cutting the wires, and a rope. To reach Feeks he had to pass through a network of wires any one of which might be charged with the deadly current, and the slightest slip would have sent him against the wires that were every instant burying themselves deeper in the dead lineman's flesh. As Cunningham slowly and cautiously climbed the ladder, there was a dead hush among the crowd—everyone looking at him with bated breath. Cunningham went up on the south side of the pole to a point a little higher than the cross-bar on which the body lay; and, after passing the rope over another bar, dropped the end of it on the other side of Feek's waist. Then, going down a little lower, he caught hold of the end of the rope with a piece of wire bent at the end, and tied it round the body just under the arms. Many willing hands obeyed his instructions to hold the other end of the rope to let the body down; and he began to cut away the wires which held Feeks up. The police did not need to keep the crowd back then. As the first black wire writhing through the air as it came down, fell to the pavement, the efforts of the people to get out of the way became almost a panic. M'Donough now climbed up and aided his comrade in cutting away the wires, until 15 or 20 had been removed. As the wire which was burning Feeks's hand was cut away, his arm fell to his side, and hung there dangling. When the wires that were gnawing at the dead man's face and throat fell to the ground, the body drooped forward until caught by the rope. It took about 15 minutes for the two men to disengage the body from the position in which it had been held for forty-five minutes. D. H. Darrah, the foreman of one of the Western Union's gangs of linemen, directed the work, and finally gave the order to lower the body. When it reached the ground, it was found that the thumb and the second finger of the right hand had been almost burned off. There was also a deep hole in the left foot, and a terrible burn across the mouth and cheeks. The wire that caught the man's throat burned half through the windpipe, and was of itself sufficient to cause death. Feeks was about 38 years old, and had been in the employ of the Western Union Company for six years. The wires which did the fatal work were not electric light wires, but were crossed with them at some point. The friction no doubt had worn away the electric light wire, and thus charged the otherwise harmless wires with a powerful current. F. W. Baldwin, wire superintendent of the Western Union Company, sent a gang of men out to ascertain where the wires were crossed. He said his men took every precaution against such an accident as that which had happened to Feeks, and always wore rubber gloves when at work on poles where there were electric light wires. As there were none on the pole on which the death took place, Feeks had not put gloves on. The greatest interest was aroused by the accident, and it formed the leading topic of conversation.

Lothammer Gas Manufacturing Company, Limited.—At a special general meeting of this Company held on Monday last week, the Chairman (Colonel H. Y. Murray) formally moved the confirmation of the following resolution, which was passed at the meeting of shareholders on the 30th ult.:—"That the agreement entered into between the Company and Mr. George Bower is hereby approved, and that the Directors be and are hereby authorized to raise the money for the payments to Mr. Bower; but that before issuing debentures, the Directors use their best endeavours to place the balance of the unallotted shares." Since the passing of this resolution at the previous meeting, a question has been raised as to the power of the Directors to enter into the agreement with Mr. Bower, which, it is stated, was done without the consent of Mr. Lothammer, who says he is ignorant of the nature of the patent proposed to be acquired under it. After a long discussion, the meeting was adjourned to the 4th prox., to enable Mr. Lothammer and Mr. Bower to meet and discuss the matter.

THE ELECTRIC LIGHTING SCHEME FOR THE CITY OF LONDON.

As briefly recorded in our "Electric Lighting Memoranda" last week, the report of the Streets Committee of the Commissioners of Sewers on their electric lighting scheme, the principal particulars of which were given in the JOURNAL for the 15th inst. (p. 752), came before the latter body for consideration at a special meeting held on the 21st inst. It was accompanied by certain specifications, with numerous suggested modifications thereof; also by reports from the Engineer (Mr. W. Haywood) and the Electrician (Mr. W. H. Preece), on the strength of which the acceptance of the tender submitted by the Metropolitan Electric Supply Company, the Anglo-American Brush Corporation, and the London Electric Supply Corporation, was recommended, subject to the last-named Company waiving their proposal to extinguish half their lamps at midnight. This they did; and thus the tenders were all brought to one figure—viz., £26 per arc lamp per annum. The area proposed to be lighted extends, it may be remembered, from Holborn to Aldgate; and is divided into three districts. In the west district, which extends eastward to the north side of St. Paul's Churchyard, there are to be 121 lamps; in the central district, comprising the south and east sides of St. Paul's Churchyard, and the area eastward to the end of the Poultry, there will be 138 lamps; and in the east district, extending to Aldgate High Street, 136 lamps. Mr. Preece, in his report, expressed the opinion that one arc lamp should, on an average, replace four gas-lamps, and that each normal arc lamp should not cost the City more than the above-named sum yearly. If this were the case, the Commissioners would not, he said, be called upon to pay much more for electric lighting than they paid for gas. The Companies' original prices were £31 15s. by the London, and £30 each by the Metropolitan and Brush Companies. The Chairman (Mr. G. Manners) having formally moved the adoption of the report, Mr. Sly opposed the motion, on the ground of the additional cost which the electric lighting would throw upon the ratepayers. He argued that the immense light which it was proposed to furnish was unnecessary in the City, and they ought to act with caution until the cost of the electric light was the same as that of gas. Mr. W. H. Pannell criticized at some length the abstracts of the tenders accompanying the report, and complained that the Committee had practically conceded a variety of objections made by the London Electric Supply Company which the others had not raised, and were proposing to pay that Company the same as the others, and get less in return. He concluded by moving, as an amendment, that the report be referred back to the Committee for further consideration. Mr. Alderman Moore seconded the amendment. Mr. C. T. Harris contended that the Committee recommended the Commission to accept tenders on totally different lines from those agreed to. He objected to electric lighting companies having the control of the streets in the heart of the City without being under statutory obligations. He characterized as suicidal the proposal to replace 1730 gas-lamps by 395 electric lamps; and argued that the cost of the new system would be nearer £13,000 than the £10,024 mentioned. For the first-named amount, he said, they could obtain much better lighting if they would only turn their attention to the improved forms of gas-burners now in use for public lamps. Let them look at what was being done in Cheapside. At Brighton the arc lights had been removed from the sea-front, and a beautiful system of gas lighting adopted instead; while in Paris the electric light had been abandoned in the Rue de la Paix and the Avenue de l'Opéra. After some discussion, the Chairman of the Committee (Mr. Day) replied; remarking that, although various objections had been raised to the report, they had not been put in a concrete form, and therefore it was not quite clear what the Commissioners desired the Committee to do. Eventually the amendment was carried almost unanimously.

THE ELECTRIC LIGHTING QUESTION AT CROYDON.

The Croydon Town Council recently had before them, at a special meeting, the question of the proposed electric lighting of the town. The matter came up on a motion by Mr. Oelrichs to authorize the Council to apply for a Provisional Order to give them the necessary powers for furnishing the light; the General Purposes Committee to report on the details incidental to the application. In support of his motion, Mr. Oelrichs referred to what is being done in various towns in the way of electric lighting; and stated that at Croydon they would be able to have, for an outlay of £6000, or probably less, an installation which would give light equal to 138,720 candles, against the 17,500-candle power of all the existing gas-lamps, costing £6300. For the sum he had named, they would, he said, have a greater supply of light than would be required for many years to come; and he expressed the belief that a large number of private people would desire to be served. The principle of his proposition was laid down some time ago, when Alderman Barrow wished to purchase the gas-works. It was too late to acquire that undertaking; but now was just the time for the electric light. Most corporations were interested in gas-works; and this was why they were slow to take up the new light. Those bodies were, however, in a totally different position to Croydon. They were no longer in the dark as to the cost of the light; and they knew that it was a sound commercial success, and would soon become a source of revenue to the borough. Mr. Thompson seconded the motion. Mr. Shirley pointed out that the estimated cost of the electric lighting scheme for the City of London, now before the Commissioners of Sewers, was twice as much as gas; and said he thought if the City could not light by electricity at the same price as gas, Croydon would not be able to do so. Alderman Haggis moved, as an amendment, —"That it is undesirable at the present time for the Corporation to seek powers to supply electricity to the Borough; notice having already been given by three companies of their intention to apply forthwith for Provisional Orders for that purpose." He said he could not understand whether Mr. Oelrichs wished the Corporation to light only the public lamps, or to supply also the private consumers. If his idea was to supply the public lamps only, it would mean an enormous expenditure, and there would be little result; indeed, it would be a most expensive way of proceeding. If, on the other hand, Mr. Oelrichs wished them to undertake the supply of private houses as well as the public lamps, this would be a very costly experiment to attempt. He could not dispute the figures, but £5000 or £6000 seemed a remarkable sum for laying down an installation, providing machinery and mains, and keeping the whole thing going. He thought it was altogether out of the question. Mr. Oelrichs had said that the cost would not be much more than half that of gas; but he (Alderman Haggis) had it on good authority that it would cost twice as much. The fittings would cost from 35s. to 40s. per light; and they would be a more expensive class of fittings than those required for gas. He thought that, as a general principle, the Corporation should not undertake anything in the least degree speculative. If they took up such a work, they should at least be assured of success. He pointed out that, owing to Croydon being a straggling borough, the laying of the wires would be a costly operation. Three companies were already competing for powers to light the town. The Corporation had nothing to be afraid of; for if these companies did not carry out the work satisfactorily, they could apply for parliamentary powers on their own account. If the companies did work well, they would be bound at the end of 42 years to hand over their works to the Corporation at their merely nominal value. He could see no reason why the Corporation should undertake electric lighting work and assume the risk when other people were prepared to do it for them. Mr. Schmitz seconded the amendment. Mr. Dobson supported the motion; remarking that the arguments against it were similar to those adduced in opposition to the scheme for the purchase of the gas undertaking, the completion of which would, he said, have saved the Corporation £51,000 up to the present time. He urged the advisability of the Council sanctioning the application for the Order. Alderman Layton opposed the motion. He said the proposition before them was to light 120 miles of streets by electricity; and he contended that this could not be done for ten times the cost of gas. If the Corporation attempted to supply the electric light, they would make a disastrous mistake. Mr. Oelrichs having replied, the amendment was put, and carried by 19 votes to 12. Mr. Dobson, on behalf of the General Purposes Committee, then moved the adoption of the following recommendation: —"With reference to the application of electric lighting companies for Provisional Orders to supply Croydon with electric light, the Committee thought it wise that conditions should be made with such company as may obtain a Provisional Order, giving the Corporation an option of purchasing their undertaking on some reasonable terms to be specified in the Order, within (say) seven or ten years. It would probably be convenient that these conditions should be arranged at an early date; and the Committee recommended that they be authorized to negotiate with the various applying companies with a view to seeing what arrangements can be made in the direction indicated; reporting to the Council before any agreement is come to." Alderman Haggis thought the information which the Committee proposed to seek was not sufficient. He wished to add that they should also inquire as to the character of the company, the proposed mode of procedure, and how they intended working. The Mayor (Mr. Alderman Hobbs) considered that this inquiry was included in the Committee's recommendation. Alderman Haggis, however, pressed his amendment to widen the scope of the Committee's operations; but, on being put, it was lost, and the original recommendation agreed to.

GAS AND ELECTRIC LIGHTING AT HASTINGS.

A sale of miscellaneous shares which took place at Hastings last Tuesday conspicuously demonstrates, writes a correspondent, that local investors have great faith in the future of the gas undertaking, notwithstanding the display that is made by the Electric Light Company in the borough. Shares in other well-known and successful concerns of a totally different character which were offered for sale at the same time, and which are paying very fair dividends, did not evoke a single bid; but when shares in the Gas Company (of which Mr. C. E. Botley is Engineer) were put forward, the Auctioneer did not find it necessary to discourse at length on the merits of the shares before eliciting offers. For some £25 shares, now earnings dividends of 12 per cent., £60 and £60 5s. were readily paid, which gives the purchaser about 5 per cent. on his investment. A number of £20 shares, on which the last dividend declared was 9 per cent., sold at from £38 to £39 10s.; and the buyers of these will obtain a return of from 4½ to 4¾ per cent. for their money. Talking of the electric light, the local authority cannot place much reliance in it as an illuminating medium, seeing that along the Parade where the light is chiefly used, they still light the gas-lamps from dusk, although the electric light is not "turned off" until shortly before midnight; and yet Hastings was one of the first seaside resorts to adopt the electric light! On the Parade, gas is not fairly matched against its antagonist; and it makes a poor show. The lanterns and burners are of antiquated design; and it is much to be regretted that Mr. Botley cannot arrange with the Corporation to put up a few of the more modern lamps which are to be seen in other parts of the borough. It is also worthy of note that the Pier Company, who use the electric light, do not see fit to discard the old gas standards and fittings, and inside the pavilion they prefer to retain gas as the illuminant.

METROPOLIS WATER SUPPLY.

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott), on the quality of the daily samples of the water supplied in London last month, say: "During the month of September the supply of water to the Metropolis has fully maintained the satisfactory character taken note of in our two previous monthly reports [*ante*, pp. 421, 608]. The supply for the past three months has been characterized by presenting a notable uniformity of composition throughout; as is especially shown by a comparison of the results furnished by the water distributed by the Companies taking their supply from the Thames. Thus the several mean amounts of oxygen required to oxidize the organic matter present in a gallon of the Thames-derived water were found to be ·040, ·037, and ·034 of a grain, in the months of July, August, and September respectively. Similarly, the mean amounts of organic carbon present in the successive months' supplies were found to be ·137, ·138, and ·138 part respectively in 100,000 parts of the Thames-derived water: while the maximum amount of organic carbon met with in any single sample examined in July was ·153 part, in August ·151 part, and in September ·148 part in 100,000 parts of the water—these maximum proportions of organic carbon corresponding, as nearly as may be, to but just over a quarter of a grain of organic matter per gallon. Having regard, however, to the seasonal fluctuations in composition (for the most part, indeed, within a very narrow range), to which river water is liable, a continuance of such low and uniform results as those above recorded is hardly much longer to be expected."

EXTENSIONS AT THE HALIFAX CORPORATION GAS-WORKS.—The Gas Committee of the Halifax Corporation have accepted the tender of Newton, Chambers, and Co. for the making and fixing of four purifiers at the gas-works for the sum of £2224; and also the tender of the same firm for the supply of hydraulic mains for the sum of £595.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.—The report of the Directors of this Company to be presented to the proprietors at their half-yearly meeting on the 5th prox., states that the profit for the half year ending June 30 last amounted to £1304 13s. 4d., which added to the balance brought forward makes £2996 19s. 7d. After paying the dividends to Dec. 31, 1888, and the interest on debentures to June 30, 1889, there remains an available balance of £1714 11s. 7d., out of which the Directors recommend the declaration of a dividend for the six months ended the 30th of June last on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum both less income-tax (except upon those dividends which are payable to the local shareholders). This will leave a sum of £547 3s. 7d. to be carried forward. The vacancy caused on the Board by the death of Mr. Arthur Clarke has been filled by the election of Mr. Charles Newton, formerly one of the Auditors.

THE WATER SUPPLY OF JOHANNESBURG.

In view of the attention now being given to the development of the resources of South Africa, it may be of interest to our readers to have some particulars as to the progress of the Johannesburg Water-Works, Estate, and Exploration Company (several references to which have been made in recent issues of the JOURNAL), the first annual general meeting of which was held on the 10th ult., under the presidency of Mr. J. Sivewright, the Chairman. The capital of the undertaking is £150,000, in £1 shares, which, with about £21,000 obtained from the bankers, has all been invested in the purchase of the Doornfontein Farm, with its grazing rights, and in the construction of permanent works, &c. The seat of operations was originally at Kimberley; but it has now been transferred to Johannesburg. The accounts presented to the shareholders on the above-named occasion were for the 14 months ending June 30 last; and they showed a profit of £30,114. After paying an interim dividend of 7½ per cent., interest on the money obtained from the bankers, and writing off £1648 for depreciation of plant and machinery, besides discharging all legal and preliminary expenses, there was left a balance of £17,790. The revenue included £7212 received for water supplied to the town and to mining companies, and £6799 for water "leadings." In the report accompanying the accounts, the Directors stated that the amount collected for water-rental did not represent so large a revenue as it should do, mainly attributable to the low tariff charged. They expressed their intention of placing meters wherever it was considered desirable, and fixing a minimum charge of 30s. per month for the supply of houses where no meters are fixed. They thus confidently anticipate a large and constantly increasing revenue from the supply of water. The cost of pumping had been rather heavy; but upon the completion of the service reservoir, with the consequent conservation of a large supply in one spot, the working expenses in this respect would, it was anticipated, be considerably reduced. The Directors acknowledged that a large expenditure, far in excess of the working capital, was shown under the head of construction; but the rapid and extensive increase of the town and the growth of the suburbs, necessitated an outlay for main and service pipes which was never contemplated when the Company was formed on its present basis. The expenditure had nevertheless been justified by the ever-increasing daily applications for water leadings, the demand for which had been almost unprecedented. The Directors further stated that, notwithstanding the doubts cast upon the Company's ability to supply Johannesburg with water from the sources at their command, there had, up to the present, been no complaint of insufficiency, nor could fault be found with the quality of the water, except in occasional instances, when, from the extension of the works (such as opening the springs, excavating the reservoirs, and laying new service-pipes) discoloration has resulted. The daily available supply from all sources was estimated by the Company's Engineer at 750,000 gallons. As he had reported that this would very shortly barely suffice for the requirements of the town and suburbs, the Directors had to look elsewhere to meet the growing wants of the population. They reported that they had been able to secure the water now flowing past the homestead of Doornfontein, which it was estimated by the Engineer, was equal to at least three times the present available supply. Between 50 and 60 miles of service-pipes had been laid in the streets of Johannesburg and the surrounding townships. Upwards of 1400 water leadings had already been laid on, and further applications were being complied with as rapidly as possible. In order to meet the expenditure, the Directors had to apply revenue to capital purposes; but as this policy might be indefinitely prolonged if the ever-growing requirements of the district were thus to be met, they decided to increase the capital of the Company to £185,000, for the acquisition of the water rights referred to, and to meet the overdraft at the bank by the issue of debentures.

The foregoing were, as far as our readers are concerned, the chief features of the report, the adoption of which was moved by the Chairman in a long speech. Referring first to the amount of the Company's capital —£150,000—he remarked that when the shareholders looked at the work that had been done, and at the enormous future before them, he had no hesitation in declaring that there was no single company in South Africa that would have kept its capital within more narrow limits than they had done. The capital was named by those who founded the Company at a time when, even with all their faith in the future, they could not for a moment have formed an idea of the extent to which the town would have grown, and the fair promises now given as to the future. If they compared themselves with other companies, he assured them the comparison would be a brilliant one. The only other concern of a similar nature to which he could refer—viz., the Kimberley Water-Works Company, with its capital of £415,000—had not done more in the shape of supplying water than they had done, if as much. But in reality they were not a water company alone. The supply of water was one of their main objects; but he was certain that in the future the other sources of income of the Company would be found to rival, if not exceed, the revenues which would come in from the supply of water. He drew attention to the fact that during the 14 months up to the 30th of June last—the time the Company had been in existence—something like between 50 and 60 miles of service-pipes had been laid and 1400 water leadings laid on. In a water company or any like industrial undertaking, it was known to everyone experienced in such matters that a good deal of time was lost at the outset before getting into the position of a revenue-earning company; and, situated as they were in the centre of Africa, and a long way from the coast, with the proverbial difficulties of transport and other obstacles to contend against, he said, in no spirit of glorification, that the Directors were to be congratulated on the report they were able to lay before the shareholders. Having quoted the paragraph in the report as to the appropriation of the credit balance of £30,114, he said the Directors considered it advisable, in place of spreading the preliminary expenses over a period of years, to write them off at once. With regard to the balance to be carried forward, it was in their power to declare a handsome dividend of 12 per cent. if they felt so inclined; but the Directors deemed it desirable to push on as fast as possible with the permanent works, and put the money into the shareholders' property, and enhance the value of it by this amount. With regard to the water revenue, it had, he said, been rumoured that the Company's revenue was not collected, and that there was something lying to their credit that ought to be taken in. That the Company did not get anything like the revenue to which they were entitled, he would not dispute; but that revenue they meant to get in, when they hoped to show a very flattering statement indeed. Referring to the decision to supply by meter, he said a "howl of indignation" had been raised in some quarters, and it was pointed out that the Directors' action would ruin the place, as Kimberley had been ruined, by debarring the public from planting trees, making gardens, and carrying out other improvements for the benefit of the town. He replied that the Company was not a charitable institution to settle down there and beautify the place, but one whose object was to get the best dividends for the shareholders; and whilst showing the public the utmost consideration, they had at the same time to protect the interests of those who entrusted them to their hands. The Directors had therefore made a commencement in the placing of meters. It was evident there were certain houses where it would be useless to put in meters. It paid the Company better, and it would be quite as agreeable to the smaller householders, to pay rental. The Directors therefore had placed it at 30s. per month, which he did not think anyone could cavil at. Coming to the subject of the means of supplying water, he said the service reservoir referred to in the report was a work he had at heart from the first. They were constructing the reservoir 60 feet above the highest point of the Market Square, so as to be independent of machinery (which was always liable to break down), and supply the town by gravitation. It would very shortly be completed. Passing on to deal with the Company's other sources of revenue, he said although the quarry licences and sale of stone had not represented a large income (£513), the stone was excellent in quality—there was no better in the locality. The town was increasing at a marvellous rate; and the market for building stone was practically unlimited. There had likewise been discovered on part of their property very good slate, which in the opinion of qualified men was adapted for paving purposes, and had likewise a good future before it. In the valley where their pumps were at work, the clay taken out was equal to any in the neighbourhood for brickmaking purposes, and they were negotiating for a rental from a company there for making bricks. He had sent some of the clay to England and received a favourable report on it; and the previous day heard from Mr. T. Newbigging, C.E., that the clay was suitable for the manufacture of fire-bricks. Another matter to which they did not fix any monetary value was the mineral rights of the property, which were believed to be extremely valuable. Returning to the subject of water supply, he commented on the paragraph in the report referring to the quality of the water. He said he had submitted a sample of the water for analysis; and the report he had received, as well as those he obtained before the formation of the Company, was of such a nature that he was perfectly satisfied that any statement against the purity of the water must have come from persons who were not interested in the prosperity of the Company. As soon as they had the reservoir completed, he was sure Johannesburg would have as pure a supply of water as any town in the world. The daily available supply from all sources was estimated by the Company's Engineer at 750,000 gallons, and obtained only 6d. per 100 gallons, he left it to them to calculate what a handsome source of revenue it was. Respecting the water flowing past the homestead, the Directors had been a little premature in making their statement. The most they had been able to do was to secure the refusal of the water on certain terms which were not yet adjusted, and the matter was still unsettled. The Directors, however, were fully alive to the advantages of obtaining it; and their sole object was to protect the interests of the Company by getting it on the lowest possible terms. The only other supply available was on the Braamfontein Farm, which supply he endeavoured six months ago to secure; but the price was so high that no business resulted. Furthermore, it was at that time in the hands of gentlemen who were doing their utmost to bring in what they called a competing scheme for the supply of water for the town. The Company had the prior right to the water on the Government portion of Braamfontein; that was to say, if the Government could ever be prevailed upon to dispose of it, they had to offer it to the Company in the first place. It had been mentioned that the Company were afraid of what was known as the Klip River scheme, or were considered antagonistic to it. He was told that many of the companies on the Rand were short of water, and that, provided it could be done at anything like a fair price, there was a market for the supply of water to the mining companies. All he could say was that so long as their present springs lasted, and with the probable additional water likely to be secured, no company could compete with them in the supply of the township; and whatever scheme came out, he should be sorry if any shareholder parted with his stock on that account. Further, it was to their interest to promote the Klip River scheme, for owing to the high-principled action of Mr. Jan Meyer, one of their first Directors, the Johannesburg Water-Works Company would, without incurring a farthing of expense, have a full quarter interest in that scheme when it was carried out. Dealing next with the general management of the undertaking, he said he had to mention that, in deference to the wishes of some of the shareholders in England and on the Continent, and without any reflection on the present excellent staff, the Directors had decided to secure the services of Mr. G. R. Andrews, of Brighton, for the purpose of investigating, and re-organizing, if necessary, the management of the Company. The suggestion came from London; and the Directors, inviting the fullest criticism, acquiesced in the proposition. Mr. Andrews would come out for a year for certain, and would sail on the 4th of October—arriving at the end of the month. He (the Chairman) was sure Mr. Andrews would prove a very valuable acquisition; and they would derive great advantage from his presence on the field. He then came to the question of increasing the capital. As the shareholders knew, the capital was all exhausted—every available penny, not only of the Company but of the revenue over and above expenditure which accrued to them, having been put into the capital—and still they were far from having completed their work. Various proposals had been made to meet the case—one being a large increase in the capital, as they contemplated laying down twelve miles of pipes. But he was averse to a large increase; and his co-Directors shared his views. They had, however, decided to increase the capital to £180,000 for the purposes referred to. They thought it better to issue debentures; and so highly was the Company thought of, that as soon as the proposal was heard of one gentleman came forward and offered them £50,000 on the security of the Company, at 6 per cent. interest. After some remarks regarding the constitution of the Board, the Chairman said that with the Directors they had, and their alternates, assisted by Mr. Andrews, there would be no better-managed Company on the Rand. In conclusion, he remarked that from the very outset he had been a firm believer in the Company, but at no moment was he so firm a believer in it as then.

After a short conversation, in the course of which the Chairman expressed the hope that on the 31st of December next a dividend would be paid out of the excess of revenue over expenditure, after which date he trusted they would be able to pay, if not quarterly, at all events half-yearly dividends, the report was adopted and the proceedings closed.

THE ARTESIAN WELL AT ALDGATE.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, Mr. Day brought up a report of the Streets Committee, recommending that tenders be forthwith advertised for to complete the artesian well at Aldgate; and that the Committee be authorized to accept such tender as they deem desirable, and take all necessary measures for speedily completing the work. In the course of the discussion on the recommendation, Mr. E. Bell remarked that they had to go down about 230 feet more, which would cost about £1700; and he thought the work would be finished in about six months. Mr. Bridgman said the well should have been completed within four or five months from the time of starting; and the delay was caused by the Commissioners accepting the lowest tender. The report was adopted.

THE VENTILATION OF SEWERS.

In the course of the Inaugural Address delivered by Mr. R. Bridge at the recent meeting of the North of England Gas Managers' Association, he described, as our readers will remember, a plan he had tried of utilizing a high-power public gas-lamp for sewer ventilation. Mr. Bridge admitted that the idea of using street-lamps for this purpose was not a new one; and this is proved by a letter addressed to *The Times* last Tuesday by Mr. John Penn, of Greenwich, who explained an arrangement experimented with by him some years ago. He said: "I caused an ordinary street-lamp to be made practically air-tight (the chimney, of course, excepted), and to be fitted with a burner so contrived that the flame surrounded the mouth of a pipe, which pipe was in direct communication with the sewer. The burner was supplied with ordinary gas. Test-papers were placed in the pipe between the sewer and the burner, and also in the chimney. The first experiment showed, by the discoloration of both papers, that sewer gas was passing through the lamp, though the lamp was not alight. The second experiment showed, the lamp being alight, by the discoloration of the paper in the pipe, that sewer gas was passing through the flame; while the paper in the chimney showed, by remaining absolutely unaffected, that this sewer gas was destroyed. The experiment was repeated; sulphuretted hydrogen being introduced with the sewer gas. In this case the test-paper in the pipe became almost instantaneously discoloured, while that in the chimney remained absolutely unaffected. The duration of this experiment was about five hours. It is obvious that, as combustion in the lamp was entirely supported by air from the sewer, the pressure in the sewer was relieved by this amount of air; and as all this air was passed through the intense heat of the flame, I venture to think that any noxious germs must have been completely destroyed. Now, it seems to me that if standard lamps, which would, of course, serve also as illuminants, were placed along the course of, and connected with the sewers and drains of towns, the pressure in these sewers and drains would be very greatly reduced, and sewer gas would not be forced into our houses, nor through those leaks, gullies, &c., which now too frequently serve as outlets to foul air." The Medical Officer of Health of Leicester (Dr. H. Tomkins), in a letter on the same subject, pointed out that Mr. Penn's idea was by no means original, as in that borough there are several such connections made to the sewers. Two years ago Dr. Tomkins conducted a series of experiments, which proved that all germ life was destroyed in the air thus extracted from the sewers and passed through a hot flame; in fact, the air was "cremated" and rendered undoubtedly harmless. At the same time the writer laid special stress upon the fact that this method of dealing with offensive effluvia from sewers is but "treating a symptom," whilst the real mischief remains unaltered. No properly constructed and maintained system of sewers should, he said, give off gases from decomposition; and when they do, it is evidence that the contents thereof are not, as they should be, rapidly conveyed away by them. To his mind the real cure is proper gradients and construction, efficient flushing and ventilation, and no sewer gas will then be present.

While on the subject of sewer ventilation, it will be convenient to mention a system devised by Mr. G. A. Wallis, M. Inst. C.E., of Eastbourne, and lately described by him to a number of gentlemen—medical men, architects, members of the Town Council, and others—specially interested in the matter. Mr. Wallis had a model of his apparatus prepared, and by the aid thereof explained his plan. He said: "In Eastbourne we have a great many flushing-tanks placed at the summits of the sewers. These tanks are filled from time to time—very frequently, I believe—with water from the Water Company's mains; and by an automatic syphon arrangement, the water is let off with considerable force and velocity into the sewers, thereby cleansing them or removing deposit. The water in Eastbourne is supplied under a very considerable pressure from the high service reservoirs; and in this arrangement I claim to use the water (which now goes directly into the flushing-tanks and then into the sewers) first in actuating a turbine, which is placed in the base of the column, and by a spindle from the turbine to a fan, which is constructed so as to create a very great upcast draught. I induce atmospheric air to pass down the street ventilators in great volumes. That atmospheric air is made to traverse the whole length of the sewers, thereby diluting to a very great extent, and I believe altogether reducing and getting rid of the gases which are formed in them. I not only do that, but by the constant passing of the fresh air down the sewers—the air striking their sides, and constantly coming in contact with the sewage matter—I believe that everything will be kept in a perfectly fresh state, so that whatever escapes from the shaft will be of a most harmless description. After having used the water which you now use in flushing your sewers, the water which is laid on to the turbine under the pressure of the reservoir passes into the flushing-tank, and you get the same flushing power from the water that you now get. So far as the water question is concerned, I gain all the ventilation which you see the model will do, without any extra cost to the Municipality. But, of course, if you desire to continue this ventilation and this flushing longer than you now use your ordinary flushing-tanks, then to whatever extent you may carry that operation you will have to pay for it." Mr. Wallis then proceeded to show the company the action of the apparatus; remarking that the shaft, from the top of which the sewer gases would pass, could be arranged to any desired height, according to the circumstances of the particular situation. It might be made an ordinary iron column with lamps attached to it; or it might be made to represent lamps such as are frequently seen on the refuges at many of the crossings in London and other large towns. The operations described by Mr. Wallis in his speech were carried out by him and his assistants with complete success. After the turbine had been set in motion, coloured air was drawn out of the sewers. Subsequently, by the use of lighted tapers, the induction of air into the sewers was shown. The system of flushing by means of the flushing-tank was also put in operation. A vote of thanks was accorded to Mr. Wallis for showing and explaining his invention to the company; and, in acknowledging it, he said he was willing to place it at the service of the town, for experiment, free of cost.

THE WATER SUPPLY OF GRANGE (LANCS.)—The Local Board of Grange, the well-known watering-place on Morecambe Bay, have lately been troubled as to the quality of their water supply; and at a recent meeting a report was read from the Water Committee, stating that analyses of the water had been made by Mr. A. J. Bernays, of St. Thomas's Hospital, London, and by Dr. Campbell Brown, of University College, Liverpool, which showed that filtering was absolutely necessary, and that an ordinary filter-bed of sand and gravel alone would not ensure sufficient purity. The authorities consulted recommend magnetic oxide of iron, in some form or other, as the best filtering material for a water supply such as that of Grange. The Committee considered the relative advantages of polarite, carbide, and oxidizer, and recommended the adoption of the first-named material. The report was adopted, and the Sanitary Committee were directed to obtain the necessary estimates for carrying out its recommendations.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

On the eve of the municipal elections, the electoral bagpipes are just now in full drone. From one end of the land to the other there is a simultaneous, deafening skirl over subjects such as gas, water, police, and road management, not to speak of others, conceivable and inconceivable, which affect, or are supposed to affect, the interests of communities. Now is the time for the ratepayers to air their grievances; and this, as is well known, they are not slack to do. It is also the time when candidates for honours unfold fair schemes of reform or improvement which, after serving their purpose, are too often consigned, without further remark, to the pigeon-holes of oblivion. In the midst of the hurly-burly, it is difficult to detect the drift of every question which agitates urban communities; but, confining myself to one or two, I may be able to pick up something of interest to some of your readers. In Edinburgh, the leading question is a political one, this being the first time that politics has played a prominent part in municipal elections. It is significant that while two years ago, when the question of the gas transfer was submitted to the electorate, meeting-houses could not be filled, on this occasion, though the issue is only one of political sentiment, they are crowded to the door. The incident does not show our representative institutions to advantage; for while there was apathy when an important question, involving a million of money, was at stake, now, when nothing which is describable is involved, the ratepayers are all on the alert and speakers are cheered to the echo. There is one question of importance which ought to be considered at this time—viz., the new water supply, but it is being elbowed out by the political question; and I am afraid this election will do next to nothing to help towards a solution of it. The community are frittering away their opportunity of discussing this important subject, which will consequently be left without instructions in the hands of their representatives. In Dundee there is no great question before the community; and this may account for the raising of some small ones—such, for instance, as the following, which was spoken by a candidate for one of the city wards:—Mr. Wilson declared that the Gas Commission was not a representative body in any way, and if representation and taxation should go together, the present constitution should be done away with. Representatives to the Gas Commission ought to be sent direct from the ratepayers and be responsible to them. The Gas Commission had become *par excellence* the "guzzling" public body, having gone to Loch Awe for their last dinner, and expended upon it something like £300. Did they imagine that the members of the Commission, if they had to come before the ratepayers in November, would dare to waste public money in that manner? In better form and more to the purpose were the remarks of another candidate, who, speaking of the introduction of electric lighting, said that if the Gas Commissioners were to be the parties to carry out that work, he would like to see the constitution of the Commission changed. At present the members of the Gas Commission were not directly responsible to the ratepayers. He certainly would have them made so; and, further, would have them made periodically to give, the same as Police Commissioners, an account of their stewardship. For every penny of money borrowed by the Gas Board the ratepayers were directly responsible; and why should not the Commissioners be responsible to them? In Perth, the outstanding feature of the election, so far as it has gone, has been a singularly lucid statement by Lord Provost Whittel, who is one of the most capable Senior Magistrates in Scotland, regarding the finances of the city, and a historical retrospect by Mr. Gow of the gas-works management since the works were acquired in 1871. The price of gas had in that time, he showed, been reduced from 5s. 10d. to 3s. 4d. per 1000 cubic feet. In Dunfermline, where there is a proposal hanging in the air to acquire the gas undertaking, Mr. Scobie the other night informed the electors, in a fine sample of platform oratory, that "the continual changes which were going on in connection with gas and other systems of lighting made it imperative that they should not rush into things. He was desirous that the facts relating to the electric light, coal gas, and water gas should be placed before the Commission; and that the information should be such that no one would be able to come after them and say that mistakes had been made. He would say meantime, however, that all the information he had from experienced men was to the effect that at present the electric light was more a luxury than anything else, and no fear need be entertained on this score in connection with the purchase of a coal gas-works. He had a great deal of information to lay before the Commission; but he might be allowed to mention one or two instances of purchase, and take Kilmarnock first. They purchased the gas-works in 1872, and at that time the gas was 5s. 10d. per 1000 cubic feet. Now it was 3s. 6½d.; and last year they had a surplus of £3649. The Paisley Corporation supplied the gas at 2s. 10d. per 1000 cubic feet, and each year they handed over from £3500 to £5000 to the Commissioners for the benefit of the town. Perth gas was 5s. 10d. per 1000 cubic feet when the works were taken over, and now the price was 3s. 4d. Last year the surplus was £1500. Greenock supplied gas at 3s. 6½d.; and had a good surplus, which they applied to reduce the rates. The Alloa Corporation purchased in 1877. The price paid and borrowed was £26,200; and now the debt had been reduced by £7175. The gas at the date of purchase was 4s. 7d. per 1000 cubic feet, and now it was 3s. 4d. Dundee purchased in 1869. The price of the gas then was 5s. 4d. per 1000 feet. Now it was 3s. 6d.; and an annual surplus was applied to the reduction of debt and other claims. He had reports from 26 Corporations in Scotland in all, which showed that all the concerns were doing well. He thought that the burgh of Dunfermline ought to follow their example, and acquire the gas-works. If the £400 spent on the street lamps was saved, a success would be achieved." These quotations must in the meantime suffice.

Carnoustie was the other week created a police burgh; and the newly-elected Commissioners have lost no time in attending, among other things, to street lighting. At a meeting last night it was resolved to erect 60 additional street lamps, and it was reported that after conference with the Gas Company, the latter had agreed to supply gas at the same rate as to ordinary consumers, with a discount proportionate to the amount consumed, which was to be ascertained by meters; and that the Company would be at the expense of connecting the lamps with the gas-mains. The cost of this to the ratepayers, it was estimated, would be 2¾d. per £1. The terms were adopted by the Commissioners.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The Convener of the Paisley Corporation Gas Committee (ex-Bailie Macfarlane), when addressing his constituents in the First Municipal Ward the other evening, had some interesting information to give in regard to the gas supply undertaking of the borough. The Gas Trust had, he said, been very prosperous for a number of years; and the surplus of this year's balance gave a very clear indication that it was still maintaining this prosperity. Notwithstanding the reduction of 2d. per 1000 feet in the price of gas which the Commissioners made last year, and

which was equal to £1500 of the revenue, the surplus of this year's balance amounted to £3721. The arrangements which the Gas Commissioners had made for carrying on the operations at the gas-works during the year on which they had entered, gave every indication that the results would be quite as successful as those of the past twelve months. Their average price of coal this year was only 1½d. per ton more than last year, which was equal to a loss of about £150. The increased consumption of gas had now compelled the Commissioners to go in for a very extensive addition to the gas-works, at a cost of £30,000. That was a very large expenditure, but the Commissioners really had no other course open to them. The daily consumption of gas had increased so much that the retort power and the storeage accommodation had become far too limited. The new gas-holder would not be ready for use till next winter; but the new retorts would be in operation in the incoming winter. When making the extension in the retort-house, the Manager (Mr. G. R. Hislop) had introduced a new system of setting the retorts, by which one fire heated eight of them, whereas under the old system one fire was required to heat two. When the retort-house was all fitted up with the new system of retorts, it would hold 256 instead of only 164 as previously; and whereas under the new system 28 fires would heat the 256 retorts, it took 32 fires to heat 164 retorts under the old system. They were putting up 192 retorts on the new system, all to be in operation within the next month or two; and the estimated saving in coke alone for firing them was about £1600. If this estimate could be realized—and he (the Convener) did not doubt that it could—it would give them interest at 5 per cent. on the £30,000 which they were spending just now, which would not be a bad investment.

I may here supplement ex-Bailie Macfarlane's remarks regarding the gas-works extensions which Mr. Hislop is now carrying out. The total saving likely to be effected by the new system of retorts is set down at about £2000 per annum (including wages), while the total cost of the 192 retorts will be only about £3000, after allowing for cost of the ordinary annual repairs that would otherwise have been necessary on the old settings. Then, as regards the new gasholder, I may mention that no fewer than fifteen firms sent in tenders for its construction—eleven of them hailing from London and other towns in England, and the other four from Scotland. The highest tender was about £17,500; and the lowest about £15,200, which was that of Messrs. Hanna, Donald, and Wilson, of Paisley, and which was accepted by the Gas Committee. The walls of the gas-holder tank will be brought up to the level of the ground within the next month or so; and the Engineers will get possession of the ground by the month of March next, and it is confidently anticipated that the holder will be finished by next September. As previously mentioned, this will be the largest two-lift gasholder in Scotland—indeed, the only one having a greater storeage capacity is that which Mr. Foulis has just had transformed into a three-lift holder at the Dawsholm works of the Glasgow Gas Commissioners.

A serious labour trouble has arisen in the stoking department of the Glasgow Corporation Gas-Works; and it is already in what may be called an acute stage. Some weeks ago a demand was made by the workmen engaged in the carbonizing department for a reduction in their hours of labour from 12 to 8 per day, and the matter has since been under the consideration of the Gas Committee. It may be mentioned that about two years and a half ago the amount of work which the men in the carbonizing department had to perform daily was reduced by about 25 per cent. The demand which they now make would be equal to a further reduction of 33 per cent., while they ask that their wages should be continued at the present rate, which is 5s. per day. The work performed by the men employed in this department is unskilled labour; and while the day's work apparently extends over 12 hours, the men in reality only work from 20 to 25 minutes each hour, the remaining 35 to 40 minutes being allowed to them for rest. If the demands now made were conceded by the Corporation, it would involve an additional expenditure in the manufacture of gas of about £20,000 per annum. The Committee have given the matter very serious consideration; but, with every desire to meet the men as far as possible, cannot see their way to accede to the terms demanded by them, which they consider to be simply exorbitant. As a compromise, however, and in order to maintain friendly relations with their workmen, the Gas Committee have offered to reduce the nominal day's work from 12 to 8 hours, with the same rate of pay, upon condition that, instead of having charge of only three benches of retorts, each man should take charge of four benches as formerly. This would simply mean that the men would have to perform the same amount of work in eight hours as they formerly did in twelve hours, and would be reverting to the system in vogue before the last reduction was made. At a conference which representatives of the workmen had with the Gas Committee yesterday afternoon, this proposal was submitted to them. They stated that they had no authority to accept it; but agreed to submit the offer to their fellow-workmen for their consideration. This (Saturday) morning a letter was received by the General Manager—Mr. Foulis—from Mr. Angus Campbell, solicitor, who is acting as the legal adviser of the workmen. The letter intimates the refusal of the offer made by the Committee; and states, on behalf of the men, that if all they had asked was not acceded to by 6 p.m. next Friday, they will cease work. It is also stated that what the men are now asking has been conceded to the gas stokers at Edinburgh and Leith, Dundee, London, Birmingham, and other places. They further allege that they are not bound to give any notice to stop work, as they could come out on strike at once; but they do so in order that the supply of gas may not be cut off without due warning. When the men asked the advance about a fortnight ago, Mr. Foulis was sent to London, Birmingham, Manchester, &c., so as to learn definitely what concessions had been made to the gas stokers in the places visited. I understand that a meeting of the Gas Committee has been called for Monday at which the action to be taken in this somewhat critical state of affairs will be carefully considered and decided upon.

Almost the only phase of the "gas question" that has shown itself at any of the Glasgow municipal election meetings at this time has been the matter of the recent increase of £250 per annum made to the salary of Mr. Foulis. The latest deliverance upon it has been that of Mr. Crawford, who at his ward meeting in the course of the present week defended his action in supporting that increase of salary. He said it was difficult to know the market value of such a man's services. Mr. Foulis had been seventeen years without an advance of salary, and his duties had enormously increased.

This has been another active and somewhat irregular week in the Glasgow pig-iron market. After being dealt in on Monday at 55s. 6d. per ton cash, Scotch warrants declined in price on Tuesday to 54s. 2½d. Since then the price has recovered; closing yesterday afternoon at 56s. 1½d. per ton cash sellers. It seems that many of the buying orders are coming from the South, where the talk of a famine in iron has greatly excited speculators. The market still looks strong; and iron continues to be steadily taken out of the public warrant stores.

There is also much activity in the coal trade. In respect of cannel, an extraordinary demand has sprung up, which, besides taking away the daily output, is making great inroad into the stocks existing at the beginning of the season. This inroad is proceeding at such a rate that it is confidently affirmed, by an authority in the trade, that by the end of next January there will hardly be a single ton remaining of those large stocks.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 26.

Sulphate of Ammonia.—The market, for present and near delivery, is quiet; and there are sellers at £11 17s. 6d., f.o.b. Hull, and at £11 15s. at Leith and Liverpool. November delivery is somewhat freely offered; but the attitude of buyers is passive. There is still some inquiry for future—principally spring—delivery; but consumers' ideas are below present values, and consequently little business is passing. Opinions about the future are, as usual, far apart; and being on the eve of the heavy production, and not far off the period of largest consumption, circumstances will regulate prices, and an expression of opinion to-day is more or less useless. Nitrate, after a slight improvement, has become very quiet again; and the value of due cargoes does not exceed 8s. 3d. per cwt., while September-October shipment can be bought at 8s. 9d.

LONDON, *Oct.* 26.

Tar Products.—Anthracene is a little firmer, and considerable business has taken place and is under negotiation. Sellers are holding out for higher prices; but buyers do not seem able to afford it. Pitch is rather easier, although the demand continues fair. Benzols are scarcely so good; but higher prices are still being paid for crude naphtha. Prices: Pitch, 25s. to 32s. 6d. per ton. Tar, 26s. to 32s. per ton, according to position. Benzols (90 per cent.), 3s. 1d. per gallon; (50 per cent.), 2s. 2d. per gallon. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 7d. to 1s. 9d. per gallon. Crude naphtha (30 per cent.), 1s. 2d. per gallon. Light oil, 4d. per gallon. Creosote, 2¼d. per gallon. Carbolic acid (60's), 3s. 4d. to 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 1d. to 1s. 1½d. per unit; "B" quality, 11½d. to 1s. per unit.

Ammonia Products.—Sulphate of ammonia is again easier, at £11 15s. Prices: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Carbonate of ammonia, 3¼d. per lb. Muriate of ammonia, brown, £22 per ton; white, £29 per ton. Sal-ammoniac, £34 to £36 per ton.

THE PEOPLE'S GAS ECONOMIZER COMPANY, LIMITED.—A Company has been registered under this title, with a capital of £20,000, in £1 shares, to acquire the patent of an invention by Mr. W. Taylor of improvements in gas-burners.

STOCKTON AND MIDDLESBROUGH CORPORATIONS' WATER SUPPLY.—A special meeting of the Works Committee of the Stockton and Middlesbrough Water Board was recently held, to consider the tenders for the supply of 13,000 tons of cast-iron pipes required for the gravitation main between the Board's storeage reservoirs now in course of construction at Hury and Blackton and the service reservoir at Sadberge which has lately been completed. Two firms put in a similar price; and it was decided to divide the contract equally between them. It is stated to be the intention of the Board to push on as rapidly as possible with the construction of the main and the works connected with it, including the tank at Larlington and the reservoir at Whorley, a little below Barnard Castle; and as the land required has already been purchased, it is expected that the main can be finished and ready for use by the time the construction of the Blackton storeage reservoir is sufficiently advanced to allow the Hury reservoir, which is rapidly approaching completion, to be filled. The Board anticipate that they will be able to do this in about two years' time. The main will discharge direct into the service reservoir at Sadberge, from whence a new 33-inch main has just been completed to Stockton, and is now being carried on to Middlesbrough. This early completion of the gravitation scheme will relieve the Water Board from the necessity of joining in any plan which may be promulgated to prevent the pollution of the upper Tees.

THE LEAD-POISONING CASES AT KEIGHLEY.—A long report was received by the Keighley Board of Guardians, at their last meeting, from Dr. Downes, one of the Medical Officers attached to the Local Government Board, in reference to the cases of lead-poisoning which have occurred in the Workhouse and Infirmary, to which reference was made in the JOURNAL for the 24th ult. (p. 609). Dr. Downes stated that of the 141 persons out of the 150 to 160 in the union establishments whom he had examined, 89 had on the gums the blue line distinctive of lead-poisoning; while in 10 cases the state of the mouth prevented this indication. There was thus 68 per cent. of the inmates showing that their systems were dangerously charged with lead. Probabilities strongly favoured the supposition that the water supply had been the cause of the mischief; and Dr. Downes recommended that the lead service-pipes should be replaced by pipes of some other metal. He expressed the hope that the Keighley Corporation would treat the whole of their water supply, with a view to lessening the danger of lead-poisoning. Dr. Russell, the Workhouse Medical Officer, presented a voluminous report, suggesting measures for safeguarding the health of the inmates. Some discussion ensued, the general effect of which was an agreement of opinion that the Corporation ought to use every means at their command to prevent the contamination of their water supply, not only to the union establishments, but to the town generally. It was decided to forward a copy of the reports to the Town Council, by a deputation.

GAS *v.* ELECTRIC LIGHTING AT BARNSLEY.—The question of the recent advance in the price of gas, and the proposal to introduce the electric light into the borough of Barnsley, are still agitating the minds of the burgesses. The members of the Lighting Committee of the Corporation lately paid a visit to London, where it is understood they viewed most of the electric lighting systems at work. Their labours seem to have induced them to make known what they have witnessed, for a notice has been issued calling a special meeting of the Council for the 22nd prox., to consider a resolution to authorize the Corporation to undertake the erection of works and the supply of the electric light. Last week a conference between the Directors of the Barnsley Gas Company and the Chairmen of the various Committees of the Council was held, to consider the position of affairs in respect to the recent advance in the price of gas. It will be remembered that, although the Lighting Committee of the Council have recently entered into a new agreement for an extension of the hours of lighting the public lamps, it has transpired that the gas used for lighting the markets and other public buildings is measured, and is being charged on the advanced scale. The deputation from the Council was instructed to lay the matter before the Directors. The conference was private; but it is stated that the Directors did not make known their intentions as to withdrawing the advance in the price. A meeting of shareholders has been called for Thursday, for the purpose of receiving a report of the Directors on the subject of the conference.

BELGRANO (BUENOS AYRES) GAS COMPANY, LIMITED.—The Directors of this Company have declared an interim dividend of 3½ per cent. for the six months ending June 30 last.

MONTE VIDEO WATER-WORKS COMPANY, LIMITED.—The Directors of this Company have declared an interim dividend at the rate of 2½ per cent., free of income-tax, for the half year ending June 30 last.

A NEW GASHOLDER FOR STOCKPORT.—The Gas Committee of the Stockport Corporation accepted last Tuesday the tender of Messrs. C. and W. Walker, of Donnington, for a new gasholder, for the sum of £10,275. There were 18 tenders—the highest being £14,227; the lowest rather over £10,000.

SALE OF SHARES IN THE WEST HAM GAS COMPANY.—On Monday last week, Mr. A. Richards sold, at Stratford, 173 £5 shares in the West Ham Gas Company. The shares have for some time carried a dividend of 10 per cent.; but, by the Act obtained by the Company last session, this rate may be increased under the operation of the sliding scale. The shares were put up in 17 lots of 10, and one lot of three. Lot 1 was sold for £120, or at the rate of £12 per share; lots 2 to 12, at £11 17s. 6d. per share; the remainder at £11 15s. per share. The Act above referred to gives the Company power to raise a further sum of £19,167 on 4 per cent. debentures. This stock will be offered to the public at the Mart on the 7th prox.

GAS EXPLOSION AT BLACKBURN.—A cottage in Parkinson Street, Blackburn, was wrecked, and considerable damage done to other property in the neighbourhood, by an explosion of gas which occurred last Friday afternoon. At the time a service-pipe was being laid to the house, and a strong smell of gas being complained of, one of the Corporation workmen went with a naked light to investigate the cause. The explosion which resulted hurled pieces of glass more than 50 yards distant; and it was felt over a wide area. The plumber and a little boy were badly injured. It transpired that the service-pipe had been connected with the main, but not with the meter, and the end of the pipe was not plugged, or only inefficiently.

A VILLAGE WITHOUT WATER.—The village of Polegate, four miles from Eastbourne, where an important junction of the London, Brighton, and South Coast Railway is situated, is now without a supply of water. Hitherto the village has been served from the Polegate Estate, which is in Chancery, and is administered by a firm of solicitors at Hastings. During the last three or four years, the leakage of water through defective pipes has become so great, that the principal supply meter has registered a far greater quantity of water than the total of the house meters; hence the Estate has been losing money, and last year the loss was said to be about £100. The administrators informed the consumers that unless they would pay the £100 deficit, and take over the pipes, and consequently carry out the necessary repairs, they (the administrators) would cut off the water supply. The consumers refused; and accordingly the administrators, after numerous threatenings, last Saturday put their threats into force; and at the present moment the inhabitants are without water.

THE ELECTRIC LIGHT UNDERTAKING OF THE BRADFORD CORPORATION.—The Gas and Electric Lighting Committee of the Bradford Corporation have more than exhausted the £15,000 which was granted some time ago for the purpose of establishing works for supplying the town with the electric light. At a special meeting of the Town Council last Saturday, authority to apply for an additional sum, amounting to £25,000, was granted, in order to enable the Committee to complete the works begun, and to meet the extra and unexpected demand for the supply of the electric light. The Chairman of the Committee (Mr. Alderman F. Priestman) stated that there was no intention of spending the additional amount at once, but it was necessary to have a smaller sum of (say) not less than £10,000 wherewith to carry on the branch already established. Their present borrowing powers were £20,000, and this sum had been slightly exceeded. The question of asking for a larger sum, therefore, was a matter of precaution, and to save the expense of making application two or three times. He gave the Council a pledge that nothing more should be expended, beyond what was required to carry on the present installation, without a special resolution sanctioning it.

THE NORTHERN COAL TRADE.—Increased activity has been shown in the coal trade of the North during the past few days. Some heavy contracts for steam coal have been decided upon for next year, at about 10s. 3d. per ton, and others are pending. Small steam coal is also being freely sold at an increased price, and from 5s. to 5s. 6d. must be looked on as the current rate for this class of coal. In gas coal, increased difficulty is felt in obtaining supplies that have not been contracted for; and it is believed that, to ensure cargoes, a little over 10s. net has been paid for best gas qualities. An additional contract has been accepted for next year for one of the great London Companies; but the price has not been allowed to transpire. The demand for gas coals will soon be at its highest; but it will continue for nearly two months before there is any large falling off. One of the special features of the coal trade is the large advance in the price of manufacturing coals, the contracts for which are now being decided on. Coal which is being delivered this year at 4s. 9d. per ton will be increased to 7s. per ton for next year's supply; and there are even larger advances made. Possibly it is within the mark to say that the contracts show an advance, on the average, of 40 per cent. Coke is also dearer; as high as £1 5s. per ton being asked for delivery over next year. Gas coke is also advancing, though scarcely in like proportion.

THE CHELTENHAM CORPORATION AND THEIR WATER ENGINEER.—A special meeting of the Cheltenham Town Council was held last Friday, to hear the report of a Special Committee appointed to investigate and consider certain complaints affecting the conduct of Mr. M'Landsborough, the Water Engineer to the Corporation. The Committee were in the first place commissioned to inquire into two specific charges; but were afterwards given power to make a general investigation. The two allegations in question were: (1) That Mr. M'Landsborough obtained the appointment of his son to the clerkship of works at the Tewkesbury Water-Works, and withheld or suppressed the application of a Mr. Davis—who had been acting as clerk of the works at the Public Library—for the appointment; and (2) the improper withholding by the Engineer of a letter of complaint against his department addressed to the "Municipal Commissioners of Cheltenham," and admittedly intended for the Town Council. Mr. M'Landsborough offered explanations on both charges; but the Committee reported that they could not accept them as satisfactory. They came to the conclusion that the charges were established, and that in their opinion the Engineer had been guilty of a grave breach of duty. Having regard to the facts and other matters brought before them, and considering also certain irregularities which the Committee considered to have been carried on under Mr. M'Landsborough's management, they were of opinion that he should be called upon to resign. After the matter had been fully discussed, the report was adopted. Mr. M'Landsborough has expressed his intention of taking steps to defend his position and character.

FYLDE WATER COMPANY.—The half-yearly general meeting of this Company was held last Thursday (Mr. G. Birley, J.P., in the chair), when the report, an abstract of which was given in the last number of the JOURNAL, was adopted. A dividend at the rate of 6½ per cent. per annum was declared, and the balance of £1680 carried forward.

THE PLYMOUTH CORPORATION AND THEIR PROPOSED STORAGE RESERVOIR.—A largely attended meeting of inhabitants was held at Plymouth last Friday on the storage reservoir question, to which reference was made in the JOURNAL last week, and a resolution was passed, with only two dissentients, in favour of the Head Weir site, as against that at Harter which is recommended by the Water Committee.

THE OXYGEN PROCESS OF GAS PURIFICATION AT RAMSGATE.—The Ramsgate Town Council have accepted the tender of Brin's Oxygen Company for the supply, at a cost of £631 and a commuted royalty of £600, of the necessary plant to produce 5000 cubic feet of oxygen per diem, for use in the purification of gas. It may be remembered that the Gas and Water Engineer (Mr. W. A. Valon, Assoc. M. Inst. C.E.) was instructed to procure this plant at the meeting of the Council on the 2nd inst.

THE SHEFFIELD CORPORATION AND THEIR PLUMBING BUSINESS.—At the meeting of the Sheffield Town Council last Wednesday, a letter was read from Alderman Gainsford and Alderman Sir H. Stephenson (as Chairman and Vice-Chairman of the Water Committee), asking to be allowed to emphasize what was said at a previous meeting, upon a suggestion that the Water Committee should cease to do plumbing work, by offering the following remarks:—"(1) The Committee or its servants do not, directly or indirectly, seek any plumbing orders; the department does only such work as is ordered unasked. It would surely be unreasonable that ratepayers who wish it should be forbidden to have their work done by the public department. (2) The figures relating to the plumbing business of the late Company were fully before the Committee (with knowledge as to how they were brought into the published accounts) when they negotiated the purchase of the undertaking. Of course, the Company would not give their plumbing profit for nothing; it had to be bought like the rest of their revenue, and it cost some £30,000. The request of the plumbers is that this £30,000 of ratepayers' money shall be handed over to them, and be paid over again out of the rates of the town. (3) If such wilful squandering of public money be ever possible, ratepayers must understand that they will immediately have to make good the cash by extra water charges or rating." The letter was entered in the minutes.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 826.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½–19½*	..	5 7 8
100,000	10	,,	7½	Do. 7 p. c.	10	12½–13½*	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 8% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	25—27	..	7 8 2
200,000	5	15 May	7½	Bombay, Limited	5	7–7½	–½	5 0 0
40,000	5	,,	7½	Do. New	4	5–5½	..	5 9 4
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	228—233	..	5 5 2
125,000	,,	,,	9½	Do. New	100	162—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	43—44	..	5 0 0
820,000	20	27 Sept.	11½	British	20	45—47	..	4 15 9
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	+1	5 0 0
89,000	10	,,	8	Do. 7 p. c.	10	15—17	+1	4 14 1
328,750	10	30 May	10	Buenos Ayres (New) Limited	10	13½–14½	..	6 18 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	+1	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	255–260*	–2	5 5 9
130,000	,,	,,	10½	Do. New do.	100	205–210*	..	5 2 4
130,000	,,	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	12	Continental Union, Limited	20	48—49	+½	5 6 2
242,680	20	,,	10	Do. New '69 & '72	14	33—35	..	5 3 9
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	24—25	–½	5 4 0
120,000	10	,,	13	Do. New.	7½	17—18	–½	5 8 7
854,060	10	,,	13	Do. do.	5	11½–12½	–½	5 6 1
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	238—243	–7½	5 13 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	–5	3 18 5
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	,,	,,	7	Do. H, 7 p. c. max.	100	158—163	–4½	4 5 10
468,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	245—250	–8	4 0 0
1,051,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	118—122	–2½	3 5 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	125—130	–1½	3 9 3
650,000	,,	,,	6	Do. 6 p. c. do.	100	167—172	–3½	3 9 9
3,800,000	Stck.	15 May	12½	Imperial Continental	100	215—220	..	5 9 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5–5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	20—21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	8½–9½	–½	5 8 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5½–6½	..	5 12 0
166,870	10	26 July	4	Pará, Limited	10	4½–5½	..	7 5 3
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	16 Oct.	10	San Paulo, Limited	10	16—17*	..	5 17 8
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	300—310	–5	5 4 10
1,350,000	,,	,,	12½	Do. B do.	100	223—228	–5	5 6 4
141,500	,,	,,	13½	Do. C do.	100	240—250	..	5 6 0
600,000	,,	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	–1	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	271—276	–2	3 8 10
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	213–217*	–1	3 9 1
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	257—261	–2½	3 9 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	174—179	–1	3 7 0
1,126,500	100	,,	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272 *Ex div.	..	3 13 6

† Next dividend, with bonus, will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

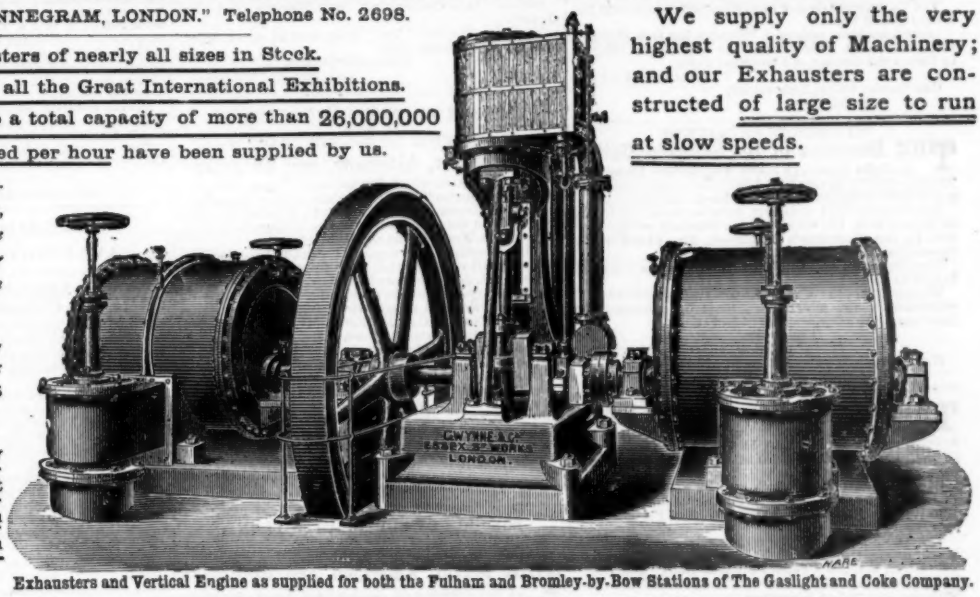
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, No. 54, BERNARD STREET, LEITH, } SCOTLAND.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.

For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

COLLECTOR, experienced, desires an APPOINTMENT. Thoroughly conversant with the duties. Highest references. Commission or Salary. Can give Security.

Please address No. 1760, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted as Manager or ASSISTANT. Home or Abroad. First-class practical Engineer; good Gas Chemist; well up in Carbonizing and Distribution; used to the Manufacture of Sulphate of Ammonia; has passed "Honours Examination" in City and Guilds of London Institute. Excellent Testimonials and References.

Address No. 1758, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Outdoor MANAGER of Tar and Sulphate of Ammonia Works. Ten years' Experience; thoroughly competent. Highest references. Age 34.

Address R., 335, KENTISH TOWN ROAD, N.W.

WANTED, a Situation as Manager of a small Gas-Works, or Gas and Water Works, by a young Man, aged 25.

Apply by letter to No. 1759, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a practical GAS-FITTER. Must be well up in the laying of both Iron and Compo., fixing Meters, Stoves, &c. Sobriety and thorough good Character indispensable.

Apply, in own handwriting, stating age and wages expected, accompanied by not more than three copies of recent testimonials, to the undersigned not later than Wednesday, the 6th of November, 1889.

JOHN SMITH.

Gas-Works, Bangor, North Wales,
Oct. 26, 1889.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.

Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 851 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award. Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

Telegraphic Address: "Braddock, Oldham."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SHIPPING AND INSURANCE.

FOR Rates of Freight, &c., apply to ROBERT BRUCE FITZMAURICE, 9, Crosby Square LONDON, E.C.

BARNSTAPLE GAS COMPANY.

WANTED, a good Gas-fitter. Constant employment and good wages. One accustomed to Dipping and Lacquering preferred.

Apply to RICHARD ASHTON, Secretary and Manager.

WORKING MANAGER.

WANTED, by the Knowle and District Gas Company, Limited, a WORKING MANAGER. Wages 23s. per week, with good House, Garden, Fuel, and Gas, and a Share in Profits.

Apply by letter, with testimonials, to the SECRETARY, Knowle, WARWICKSHIRE, on or before the 6th of November next.

WANTED, 50 "Bower" Gas-Lamps on the Regenerative Principle. Must be new, or in condition equal to it. Single ones bought.

Address, stating net Cash Price, No. 1755, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Messrs. R. and J. Dempster have FOR SALE, owing to the making of some extensive Alterations at the Coventry Gas-Works—

Seven PURIFIERS, 20 feet square, complete with Lids, Grids, Tee-Bars, Lifting Apparatus, &c., &c. The Purifiers are of modern construction, strong and durable, having the Lutes cast on the side Plates; and all Joints are planed. The Purifiers will be sold cheap, either singly or as required to suit purchasers; and they can be delivered free on Rails, or Messrs. R. and J. Dempster will be glad to give a price delivered and fixed complete at any Gas-Works.

Also two 18-inch FOUR-WAY VALVES and Connections.

Also two LIVESEY WASHERS, capable of passing 2 million cubic feet of Gas per day each.

For further particulars, apply to Messrs. R. & J. DEMPSTER, Newton Heath, MANCHESTER.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.

120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.

JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys*

Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

ESTABLISHED 1869.

HYDRATED Oxide of Iron (Bog Ore). Purity and Uniformity of Quality guaranteed. Stocks kept at MINES for direct Shipments to any Port, also at Garston Docks.

GEO. G. BLACKWELL, Mine Proprietor, 25, 26, and 27, Irwell Chambers, W. LIVERPOOL.

FOR SALE — Wright's Experimental CLOCK, in Polished Mahogany Case; quite equal to new. As used with all Standard Photometers. Purchased two years ago for £11. Price for Cash £7. Warranted correct.

Address GEORGE BULLOCK AND CO., Jewellers, St. Matthews, IPSWICH.

BY ORDER OF THE DIRECTORS.

£19,167 Perpetual Four Per Cent. Debenture Stock of the West Ham Gas Company, authorized to be raised in pursuance of the "West Ham Gas Act, 1889," and offering to Trustees and others Investments of the soundest character.

MR. ALFRED RICHARDS is favoured with instructions from the Directors of the West Ham Gas Company to submit the above for Sale by Auction at the Mart, Tokenhouse Yard, E.C., on Thursday, Nov. 7, 1889, at One for Two o'clock precisely, in Lots of £100 Stock.

Particulars may be obtained of the SECRETARY to the Company, at the Offices, Union Street, STRATFORD, and of the AUCTIONEER, 8, NEW BROAD STREET, E.C.

Gas Shares in well-known and flourishing Companies offering Investments of a sound character.

MR. ALFRED RICHARDS will Sell by Auction at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 5, 1889, at Two o'clock precisely, in convenient Lots, 169 SHARES in the following Companies:—

Harwich Gas Company	45 Shares.
Herne Bay Gas Company	37 ,,
Walton and Weybridge Gas Company	25 ,,
Carshalton Gas Company	25 ,,
Ascot Gas Company	25 ,,
Grays Gas Company	18 ,,
Brentwood Gas Company	4 ,,
Barnet Gas and Water Company	£100 Stock.

Particulars may be had of the AUCTIONEER, Tottenham, and 8, NEW BROAD STREET, E.C.

COLNE AND MARSDEN LOCAL BOARD.

THE Gas Committee of the above-named Board are prepared to receive TENDERS for Wet and Dry GAS-METERS which may be required by them for the ensuing Twelve months.

Full particulars and forms of tenders may be obtained on application to the undersigned.

The Committee do not bind themselves to accept the lowest or any tender.

Sealed tenders, endorsed "Tender for Gas Meters," to be sent to the Chairman of the Gas Committee, on or before the 4th day of November next.

THOMAS VARLEY.

Gas-Works, Colne, Lancashire,
Oct. 16, 1889.

TO GASHOLDER MAKERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for adding THIRD LIFTS to two TELESCOPIC GASHOLDERS (each 150 feet diameter) at their Neepsend Station.

Specification and drawings may be seen, and forms of tender with bill of quantities obtained, on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, marked "Tender for Enlarging Gasholders," addressed to the undersigned, must be delivered not later than Saturday, the 2nd of November.

By order,
HANBURY THOMAS, General Manager.

Gas Company's Offices, Commercial Street,
Sheffield, Oct. 18, 1889.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the Supply and Erection of an IRON ROOF (100 feet by 50 feet), to form a Coke-Shed at their Effingham Street Station.

Specification and drawings may be seen, and forms of tender with bill of quantities obtained, on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, marked "Tender for Iron Roof," addressed to the undersigned, must be delivered not later than Saturday, the 2nd of November.

By order,
HANBURY THOMAS, General Manager.

Gas Company's Offices, Commercial Street,
Sheffield, Oct. 18, 1889.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations, during a period of One, Two, or Three years, commencing on the 1st day of January, 1890.

The annual quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	525,000 gallons.
Canons' Marsh	470,000 "
Stapleton	400,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 4th day of November prox.

JAMES V. GREEN, Secretary.

Gaslight Offices, Canons' Marsh,
Sept. 20, 1889.

TENDERS FOR TAR.

THE Directors of the Huyton and Roby Gas Company are prepared to receive TENDERS for the surplus TAR made at their Works during the year ending the 31st of October, 1890.

The probable quantity of Tar will be about 120 tons.

Delivery, into Contractors' Tank-Wagons at Huyton Quarry.

Tenders, endorsed "Tar," to be sent in on or before the 9th of November, 1889.

FRED. PRITCHARD,
Secretary and Manager.

BOROUGH OF BURTON-UPON-TRENT.

NEW PURIFIER HOUSE—CONTRACT No. 6.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the Construction and Erection of a New PURIFIER HOUSE, and the execution of Works incidental thereto, at their Gas-Works in the said Borough.

Full particulars and copies of conditions, specification and bill of quantities, with form of tender, may be obtained, and the drawings viewed, on payment of five pounds (which will be returned on receipt of a *bond fide* tender, with bill of quantities fully priced out) on application to the Gas Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.

Persons desirous of contracting are requested to make early application, as only a limited number of copies will be issued.

Sealed tenders, endorsed "Tender for New Purifier-House," are to be delivered to me at or before Ten a.m. on Saturday, the 2nd of November next.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

T. N. WHITEHEAD, Town Clerk.

Burton-upon-Trent, Oct. 19, 1889.

BOROUGH OF BURTON-UPON-TRENT.

NEW PURIFIERS, &c.—CONTRACT No. 7.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competen persons for the Supply, Construction, Erection, and Fixing of Four PURIFIERS and TRAVELLING LIFTING GEAR for same, and for the COLUMNS, GIRDERS, JOISTS, and STANCHIONS, forming Superstructure, together with a CENTRE-VALVE and CONNECTIONS; also a Wrought-Iron ROOF, &c., for a new PURIFIER HOUSE at the Gas-Works, in the said Borough, and the Execution of Works incidental thereto, respectively.

Full particulars and copies of conditions, specification, and bill of quantities, with form of tender, may be obtained, and the drawings viewed, on payment of five pounds (which will be returned on receipt of a *bond fide* tender with bill of quantities fully priced out) on application to the Gas Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-on-Trent.

Persons desirous of contracting are requested to make early application, as only a limited number of copies will be issued.

Sealed tenders, endorsed "Tender for New Purifiers, &c.," are to be delivered to me at or before Ten a.m., on Saturday, the 2nd of November next.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

T. N. WHITEHEAD, Town Clerk.

Burton-upon-Trent, Oct. 19, 1889.

LANCASTER CORPORATION.

TENDERS FOR GASHOLDER EXTENSION.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the necessary ALTERATION and ADDITION for converting a 135-feet diameter SINGLE-LIFT GASHOLDER into a Three-Lift, at the Corporation's Gas-Works, St. George's Quay, Lancaster.

Plans may be seen, and copies of specification may be had, on application to the undersigned, on payment of two guineas, which will be returned on receipt of a *bond fide* tender.

Sealed tenders, endorsed "Tender for Gasholder Extension," to be sent to Thom. Swainson, Esq., Town Clerk, Lancaster, on or before the 16th prox.

The Committee do not bind themselves to accept the lowest or any tender.

CHARLES ARMITAGE.

Gas-Works, Lancaster, Oct. 15, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2.—CONTRACT No. 23.

LANCASHIRE BOILERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply and Erection of three LANCASHIRE BOILERS, 26 ft. by 6 ft. 6 in., at their Aylestone Road Works. Foundations will be provided by the Gas Committee.

Specification and form of tender may be obtained upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Boilers," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, the 9th of November prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Oct. 23, 1889.

RAWMARSH LOCAL BOARD GAS-WORKS.

CONTRACT NO. 4.—TO IRON FOUNDERS AND GASHOLDER MAKERS.

THE Rawmarsh Local Board are prepared to receive TENDERS for the Construction and Erection of a GASHOLDER and the STRUCTURAL IRONWORK of BUILDINGS on the Premises at Parkgate.

The drawings and specifications may be seen at my Office in Rawmarsh, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from me, the undersigned, or from the said Engineer, on deposit of two guineas, which will be returned on receipt of a *bond fide* tender.

Sealed tenders, endorsed "Gasholder and other Ironwork, Contract No. 4," to be addressed to the Chairman of the Gas Committee, and sent so as to reach me not later than Twelve o'clock noon on Monday, the 4th of November next.

The Board do not bind themselves to accept the lowest or any tender.

By order,
J. W. BELLAMY, Clerk.

Local Board Offices, Rawmarsh,
Oct. 24, 1889.

C. & W. WALKER.

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Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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Chemist and Superintending Gas Examiner to the London County Council.

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FOR THE YEAR ENDED DECEMBER 31, 1888.

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ALFRED LASS,

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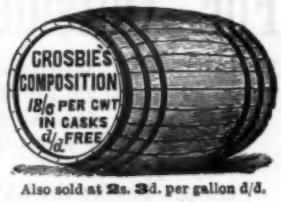

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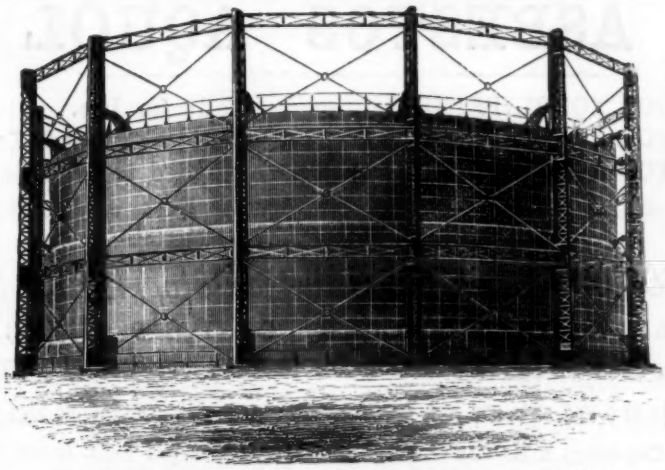

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TRADE MARK. BELL'S ASBESTOS

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

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BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

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BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

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Every 10 feet has Label as above, and bears our Trade Mark.

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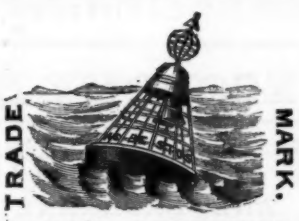

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Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

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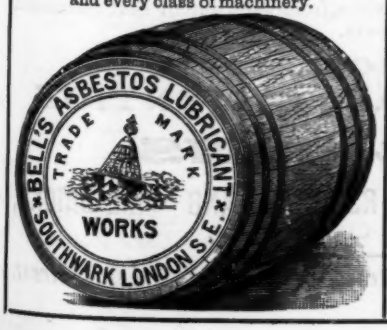
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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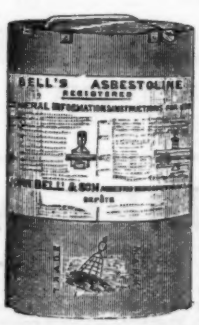
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.



ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

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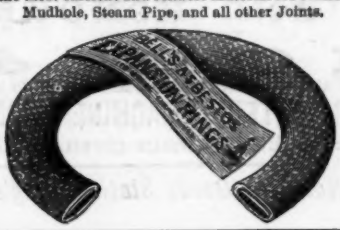
Is the most efficient and reliable Material for Manhole, Mudhole, Steam Pipe, and all other Joints.



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Will reduce loss by radiation, and saves 40 per cent. of fuel.

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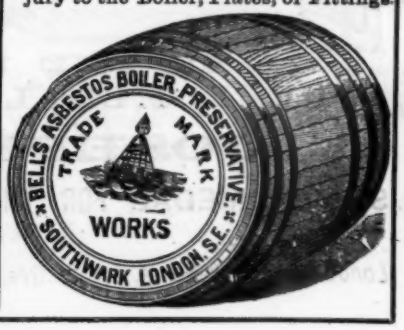
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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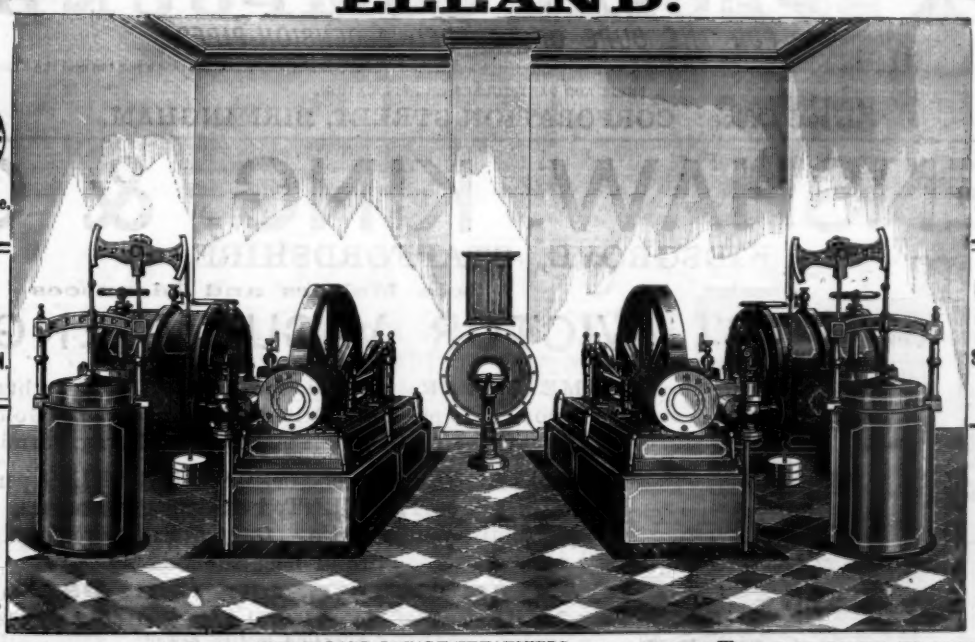

No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

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OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

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INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE** per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

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POWER CHARGING AND DRAWING MACHINES, driven by **Wire Rope, Steam, or Compressed Air.**—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of CIRCULAR, OVAL, or ⌂-shaped MOUTHPIECES, with Morton's Self-Sealing Lids, fitted with

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which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

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A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

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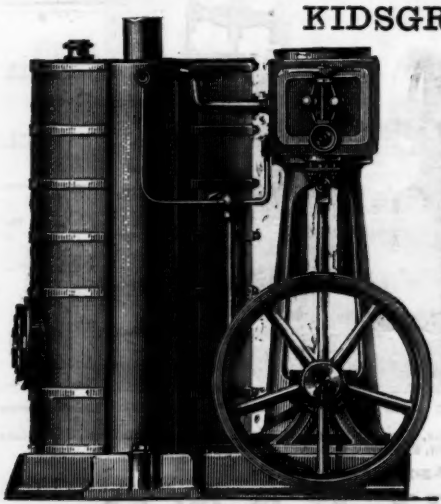

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